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THE UNIVERSITY OF ALBERTA

A STUDY OF AIRCRAFT MAINTENANCE TRAINING IN SELECTED GOVERNMENT SPONSORED AND PRIVATELY FUNDED INSTITUTIONS

by

Ⓒ NORMAN F. WILSON

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF EDUCATION

DEPARTMENT OF INDUSTRIAL AND VOCATIONAL EDUCATION

EDMONTON, ALBERTA

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UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "A Study of Aircraft Maintenance Training in Selected Government Sponsored and Privately Funded Institutions" submitted by Norman F. Wilson in partial fulfillment of the requirements for the degree of Master of Education.

ABSTRACT

One of the primary responsibilities of technical training planning whether it is conducted for a single program or on a provincial basis for a number of institutions, is to make suggestions for the future allocation of human and financial resources for training. In order to arrive at an intelligent and informed decision about the costs of training, it becomes advantageous to assess many of the alternative methods or systems of training which may provide ths singular most cost-beneficial course of action.

The findings of this study provide the cost-of-training data on Aircraft Maintenance Engineers at the Southern Alberta Institute of Technology and three company-training schemes in the United Kingdom. This cost-of-training information provided the basis for a cost-comparative study between industry-funded and traditional publicly funded programs of training. The value of such a cost comparison and analysis lies in its usefulness as an information tool by the decision-makers who are charged with reviewing, assessing, and improving Aircraft Maintenance Engineer programs in Alberta.

In addition, the description of an alternative system of financing Aircraft Maintenance Engineer training was presented (i.e. the Industry Training Boards) in the study in order to provide a working and viable financial alternative training strategy to the system of public funding of Aircraft Maintenance Engineer training presently employed in Alberta.

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The writer gratefully acknowledges the assistance of the many individuals who contributed to the presentation of this thesis.

Special thanks go out to R. Bonney of the Air Transport and Travel Industry Training Board, W. G. Jones and R. Belot of the Southern Alberta Institute of Technology, A. H. Fox of the Southall College of Technology, C. A. Ward and K. Potts of the Aeronautical Training Group, W. W. H. Wilson of Monarch Airlines Limited, G. I. Waldron of British Airways, and K. W. Goody and K. J. Anderson of British Caledonian Airways. Their cooperation and assistance was sincerely appreciated.

Sincere appreciation must also go to the writer's committee members - Dr. H. D. Tichenor and W. G. Jones - whose interest in the undertaking of this thesis will always be remembered. The writer also thanks Dr. H. R. Ziel - thesis supervisor - for the guidance and understanding shown during the project.

Finally the writer would like to acknowledge the enduring support of his wife who helped in a very large way to make this all possible.

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CHAPTER I

INTRODUCTION AND OVERVIEW OF THE STUDY

I. INTRODUCTION

Expenditures on post-secondary training in Canada have increased since World War II. This increase in the funds required for training purposes has been due, in part, to world-wide monetary inflation and currency fluctuations. As a result, the costs of materials, machinery, equipment, and labor have risen. Paralleling these rising expenses has been the large number of youth requiring increased training opportunities in order to compete successfully in the changing labor market.

This transition of labor markets' requirements relates to the period following World War II when vast quantities of new knowledge were realized. From these discoveries developed numerous and complex technologies which industry was quick to adapt for its own uses. This adaptation has increased the complexity of many industrial processes to the point where it became necessary to have a more highly trained and specialized work force. However, the funds required to achieve this higher level of training and educational sophistication were not without limit. The tax-paying public, who would bear a large portion of this financial burden, began to question the allocation of these large amounts of money. Guy (1971:1) quotes Wells as saying:

> "Rising costs of education and of all aspects of government are creating concern among tax-payers.... It is clearly becoming more necessary to assure the judicious use of tax funds for educational purposes."[1]

---

[1] Guy, J.Y.A. A Unit Cost of the Saskatchewan Comprehensive High Schools. Ph.D. Thesis, Department of Education Administration, University of Alberta, 1971.

(In the Province of Alberta, the increases in the financial requirements of all sectors of the educational system, with special consideration shown to the technical training institutions, are evidenced by the Annual Reports of the Alberta Department of Advanced Education and Manpower.)

The growing concern of the tax-paying public, with their increasing awareness of rising educational and training expenditures, has prompted research into alternative methods of financing training programs.

An alternative to the growth in the expenditures on training programs, particularly Aircraft Maintenance Engineering technology, may be that the industry which directly benefits from the use of these trained technicians - in this case the aerospace industry - should assume more of the financial and training responsibilities. In the United Kingdom, such a system of cooperation in training between the aerospace industry and government is presently in existence. It is known as the Air Transport and Travel Industry Training Board.

If the British experience of funding Aircraft Maintenance Engineer training by an Industry Training Board does present a more effective financial alternative than the Alberta technical school system, then this industrial involvement in training should be further explored.

II. OBJECT OF THE STUDY

The object of this study was to determine if it was more or less costly to train Aircraft Maintenance Engineers in the United Kingdom (financed by industry), or at the Southern Alberta Institute of Tech-

nology (publicly funded).

In order to ascertain these costs of training, the following steps had to be taken:

1) To determine how the programs for training Aircraft Maintenance Engineers were developed in the United Kingdom and in Alberta.
2) To gather costs of training an Aircraft Maintenance Engineer by the Alberta system of public funding (Southern Alberta Institute of Technology).
3) To gather the costs of training Aircraft Maintenance Engineers by representative companies coming under the jurisdiction of the British Air Transport and Travel Industry Training Board.
4) To compare the costs incurred in training an Aircraft Maintenance Engineer in a publicly funded system (Alberta, Canada) and in an industry-financed system (United Kingdom), and to determine any cost differences.

With the results from the data, an attempt was made to answer the question, "Is the system of post-secondary technical training of Aircraft Maintenance Engineers in Alberta the most efficient method of training (financially), or is there greater financial merit in training by industry?"

III. REASONS FOR SELECTION OF THE AEROSPACE INDUSTRY

The choice of the aerospace industry and the training of its maintenance engineers was made because the industry is technically

dynamic. That is to say, the aerospace industry has constantly adapted new technological advances to their aircraft design and performance. Many technological challenges are present in any transportation vehicle; however, the modern aircraft epitomizes many of the latest state-of-the-art accomplishments in design, drafting, metallurgy, propulsion, and electrical and hydraulic systems.

To organize this multitude of technologies, to gather the necessary personnel, to manufacture components, and then to assemble them into an aircraft is a gigantic industrial undertaking. Industrial efforts of this nature require that close liaison be established between the industry and government departments of transportation. Such a liaison assures that the aircraft will be operationally safe, and this requirement demands that those who service and maintain the vehicle are highly trained and licensed.

The level of proficiency required for licensed aircraft maintenance personnel in Canada remains very high. (See Personnel Licensing Handbook, Volume 2, Part I, Chapter VIII, Air Regulations, Department of Transportation, Civil Aviation Branch, Ottawa, Ontario, Canada.)

Also, the numbers of and demand for the Aircraft Maintenance Engineer may be broadly representative of a situation where shortages of skilled manpower may exist. This situation is now becoming evident in the United Kingdom, United States, and Canada, who all may soon be confronted with a shortage of licensed maintenance engineers.

In the United States, a National Business Aircraft Association official has said:

> "Shortages of mechanics, rather than pilots, is seen as a more acute problem in the future. Estimates are that the general aviation industry (U.S.) requires

> 7,000 new mechanics a year to compensate for growth and requirements and currently there are 5,000 students in all of the Federal Aviation Administration schools. This leaves us (general aviation) 22 percent short of mechanics now, and 7,000 short in 1983." [2]

Commuter airline companies are also facing the same shortages of skilled mechanics for their maintenance operations. As one commuter airline president said:

> "We can train a person to become a competent co-pilot in less than a year, but it takes four years to train a good mechanic, and the entire commuter industry is hunting for mechanics." [3]

In the United Kingdom the situation is similar and the projected shortage of Aircraft Maintenance Engineers has prompted a study to be undertaken by the British Air Transport and Travel Industry Training Board. This study projects the numbers of aircraft maintenance personnel required in the United Kingdom by the early 1980's. (See Appendix A.)

In Canada it would also seem reasonable to assume that the Canadian aviation industry may be confronted with a similar problem regarding shortages of Aircraft Maintenance Engineers.

IV. DEFINITION OF TERMS

1. Technical - pertaining to a specialized knowledge or skill, especially to a mechanical or scientific knowledge of skill.
2. Training - refers to the rendering of skills, proficiency, or qualifications by systematic instruction.

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[2] Air Maintenance Foundation Newsletter, August, 1978

[3] Aviation Week and Space Technology, September, 1978.

3. Technical Training - instruction in a technical trade or vocation.
4. Technician - refers to a person who:
    (a) is trained or skilled in the technicalities of a trade or vocation;
    (b) is trained to understand the design factors and limitations of manufactured products utilizing a wide range of materials; and,
    (c) has the ability to analyze problems.
5. Aircraft Maintenance Engineer - a person trained and licensed to service, repair, and overhaul aircraft or their components.
6. Cost - the price paid to acquire, produce, accomplish, or maintain anything; outlay or expenditure of money.
7. Cost Analysis - the separation of an entity into its constituent cost elements.
8. Cost Benefit Analysis - an examination of the comparison of all the financial and relevent resources (dollar value) required to achieve an objective with the probable benefits (dollar value of results), in order to aid in managerial decisions as to the desirability of initiating or continuing a program.
9. Cost Effectiveness Analysis - a comparison of the resources required (predicted cost) for an output of feasible alternative strategies for the achievement of a program, in order to aid management to select the better strategy for either increased production for a set cost, or for the achievement of a set level of production for the least cost under differing conditions.
10. Instructional Cost - limited to designating training program ex-

penditures, i.e. direct and indirect instructional costs.

11. Direct Instructional Cost - that portion of the instructor's salary that is allocated to the scheduled teaching of assigned classes of students.

12. Indirect Instructional Costs - all other costs exclusive from direct instructional costs, i.e. supplies, clerical assistance.

13. Costing Categories -

    (a) Personnel Costs - all costs pertaining to staffing, including any bonuses and commissions.

    (b) Production Costs - materials and machines which may be used wholly or in part for training purposes.

    (c) Administration Costs - all costs required in the management of a training program.

    (d) Materials - cost of purchasing materials and the handling, shipping, and storage costs involved.

14. Training Department - the identification of the number of department members whose primary function is to train personnel. These functions include:

    i) recruitment and selection of staff
    ii) establishing training needs
    iii) designing courses
    iv) arranging courses
    v) running courses
    vi) servicing courses
    vii) assessment of training
    viii) general management.

V. DELIMITATIONS OF THE STUDY

1. Costs of training were confined to only those industries in the United Kingdom which offered Aircraft Maintenance Engineer training.
2. Only those industries which offered Aircraft Maintenance Engineer training in the greater London area were considered in order to offer reasonably long research interviews and possible re-visits.
3. Time allowance for the direct interview of the subjects concerned was confined to a period of 34 days in the United Kingdom which constituted the time during which the research could take place.
4. Only those industries which came under the jurisdiction of the Air Transport and Travel Industry Training Board would qualify as researchable.
5. Only those industries which replied positively to the request for cooperation and assistance were approached for cost data.
6. Three of those British industries replying positively were chosen in order to narrow the study to an operable size. (British Airways, British Caledonian, and Airline Engineering Limited train 70 percent of the Aircraft Maintenance Engineers in the United Kingdom.)
7. The Southern Alberta Institute of Technology alone was considered, as it is the only technical institution in Alberta which offers Aircraft Maintenance Engineer training.

VI. LIMITATIONS OF THE STUDY

1. Any detailed inspection of the costs of training were limited by the following factors:
    - (a) Contact: there was difficulty in obtaining interviews with those officials who were in the position to have access to the cost information.
    - (b) Reticence: there was reluctance on the part of some official company spokesmen to divulge or fully explain any pertinent costs.
    - (c) Circumstance: many of the needed cost figures were not available and had to be estimated by company officials.
    - (d) Formula: much of the cost information was not expressed in a form which could be easily understood and translated.
    - (e) Time: many of the company officials could not give as much time to the interviews as was needed for a fully accurate coverage of the data.
    - (f) Accuracy: not all the cost data could be accepted as being completely accurate.
2. There could be no strict accounting formula used for obtaining the exact cost of training because of certain confounding variables found in the Aircraft Maintenance Engineer program of studies:
    - (a) courses differed in length of study, course content, amount of instruction, and quality of instruction;
    - (b) divided classes, length of training year, work release, and accelerated teaching methods made the courses different; and

(c) personnel and trainees' salaries differed from industry to industry.

3. Trainees in the United Kingdom were paid a salary, and students at the Southern Alberta Institute of Technology pay their own expenses. This salary variable increased the cost of training for those industries in the United Kingdom.
4. Research and development costs were difficult to derive from the general cost figures.
5. Capital investments and costs of buildings were considered to be a non-issue in this study, and amortization levels on training equipment were not considered.
6. Costs of material, equipment, and facilities change rapidly and are difficult to approximate in a small time-frame.
7. Currency and therefore costs fluctuate very rapidly between the United Kingdom and Canada.
8. Inflation rates and the costs of living differ between the United Kingdom and Canada.
9. Trainee intake into the institutions and industries changes from year to year.
10. Only limited sources of research material were available on the costs of training Aircraft Maintenance Engineers, both in the United Kingdom and in Canada.

VII. ASSUMPTIONS OF THE STUDY

It was assumed that:

1. The cost data supplied by the institutions and industries was obtained from figures compiled during the 1978 calendar year.
2. The age, education, general health, and intelligence of the trainees were similar in both countries.
3. The levels of technical training found in Alberta and in the United Kingdom were approximately the same.
4. The cost accounting procedures employed by the various industries were similar.
5. Factors such as taxation, utilities, etc. were considered approximately equal - e.g. climate (increased heating - cost of oil and electricity).
6. Tuition monies paid by the trainees would not contribute significantly to lowering the total costs of training.
7. Costs of living and rates of inflation were considered to be roughly the same.
8. The Canadian designation of Aircraft Maintenance Engineer and the British designations of Aircraft Maintenance Technician and Aircraft Maintenance Craftsman perform the same tasks of repair and maintenance of aircraft and are assumed in this study to be approximately equivalent.
9. The results obtained by the study of the training in the aerospace industry could be applicable to other technical training areas.

VIII. IMPORTANCE OF THE STUDY

A need for a cost-comparative study of this nature within Aircraft Maintenance Engineer training was required to:

1. Counteract a situation in Canada where a large emphasis has been placed on the United States' experience in technical training (Aircraft Maintenance Engineer), while the European experience in technical training (United Kingdom) has not been fully explored in terms of financial costs of training Aircraft Maintenance Engineers.
2. Suggest that the aerospace industry assume a greater financial share of the actual costs of training Aircraft Maintenance Engineers. The reason for this is that it (the aerospace industry) directly benefits financially from the employment of the product (Aircraft Maintenance Engineers) of the technical institutions.
3. Illustrate, by means of cost comparison, that the training of Aircraft Maintenance Engineers within industry is possibly a more financially-efficient system of training than aircraft maintenance training funded by the public sector.
4. Suggest that government and industry should be in closer liaison with regard to technical training. This cooperative effort would possibly allow for a more financially efficient and accelerated upgrading of technical skills and hasten the accommodation of technological change.
5. Given a predicted shortage of trained Aircraft Maintenance Engineers in the United Kingdom and the United States, a

suggestion can be made that the Alberta technical institutions involved in such training prepare for a possible shortage of trained personnel which would be greater than their present physical and financial capabilities could meet. This need for an expanded program could be achieved by an alternative system of funding and training presently functioning in the United Kingdom (The Air Transport and Travel Industry Training Board.

IX. SUMMARY OF CHAPTER I

Good financial management and planning result when the administrators of technical training are fully aware of the studies being made by other countries towards alternative systems of funding.

Canada, in particular Alberta, has not been alone in having to cope with the expenses inherent in training for technical areas.

The Aircraft Maintenance Engineer program is an excellent example of the large expense involved when specialized facilities, equipment, and instructors are required for training. However, many questions arise: Can public taxation shoulder the training burden? Can the technical institutions provide the facilities required and, in fact, is increased training facilities the best possible solution? What are the costs to Alberta if her citizens do not receive adequate technical training? These costs may be enormous, both from the standpoint of being unproductive and of putting financial demands upon social agencies.

Answers and solutions may be found in the discovery and utilization of the funding experiences and financial solutions of other industrialized nations who have experienced similar problems.

CHAPTER II

THE INDUSTRY TRAINING BOARDS

I. INTRODUCTION

One of the nations which has employed a system of funding technical training other than by public taxation is the United Kingdom. They adopted a different system of funding for a variety of reasons.

The foremost reason appears to be that British industry at the end of World War II operated with a small reserve of technically-skilled workers. Recurrent labor shortages in many of the trade areas were experienced. These shortages of technical workers, coupled with the ever increasing need for trained personnel in industry, became a major obstacle to sustained British economic growth and prosperity.

In order to alleviate the skilled manpower shortage, attempts were made by the British government to forecast future personnel requirements and to make preparations for training. These attempts met with little success. The reason for failure was that in many technical occupations there was a substantial flow of workers from one industry to another, and from one employer to another.

British industry, working with government, then reasoned that if the trained manpower shortage was ever to be alleviated, the existing and any future labor force would have to be utilized much more effectively. This effective utilization of trained personnel could be accomplished either by using more automated equipment, by deploying the existing labor force more effectively, or by improving the technical skills of existing workers.

The last alternative, to improve the technical training or retrain-

ing the existing labor force, appeared to be a feasible solution to the problem. The primary difficulty with retraining the work force was that the existing systems of technical training could not cope with the shortage effectively. There were too few technical training institutions, and in most cases, they were overcrowded and understaffed.

The British apprenticeship system was not entirely satisfactory as a technical training system. First, it could not supply all the skilled workers needed, and secondly, the system was deficient as a method of training.

The inability of the apprenticeship system to supply skilled manpower can be explained by the relatively long period of time necessary to train a journeyman or craftsman (usually four to six years). As a method of training, the apprenticeship system was found to be lacking in the areas of instructional techniques, close supervision, adaptation of new knowledge, coverage of the trade by the apprentice, and the standards of competence.

These difficulties and deficiencies in the British technical training schemes led the British Government to establish a sub-committee under the chairmanship of the Parliamentary Secretary to the Ministry of Education, Robert Carr. This sub-committee was formed to look into the question of industrial-technical training and the adequacy or inadequacy of the existing technical training institutions.

The findings of the Carr Committee were published in 1958 in the form of a report which recommended that industrial-technical training should be developed on the existing educational foundations and that *the responsibility for training should lie with industry.*

In 1961, a government White Paper, entitled "Better Opportunities

in Technical Education", was published. The report outlined some of the proposals designed to revise and to improve the whole system of technical training in the United Kingdom.

Certain questions still remained on the revision of the technical training system and the first was how to encourage industry to establish systematic training systems. Some form of financial inducement seemed to be the solution to encourage British industry to undertake the technical training programs.

The scheme which was given the most support was the concept of a training levy, determined individually industry by industry, governed by an industry training board.

A White Paper setting out this course of action was published in December, 1962. In March, 1964, a bill was presented to the British Parliament. This bill became known as the Industrial Training Act.

II. THE INDUSTRIAL TRAINING ACT

The Industrial Training Act gave the Minister of Labor powers to establish industrial training boards, and to set out the duties and functions of each training board. The Act left the training matters such as course content, length of training, and the standards to be achieved to be determined by each of the training boards concerned, but any final decisions were to be approved by the Minister of Labor.

The Act did not require an employer to provide any technical training. However, it did establish a system of financial inducements whereby the employer was presented with a choice between training or contributing towards the costs of other employers in the same industry

who would do the training. If the employer chose to do the training, the Act provided him with the financial incentives to do the task well.

The major responsibility for expanding and improving training rested with the industry involved and not with government, for the anticipated effect of the Act was to create a working partnership between industry, the educational system, and government with each one having a special contribution to make.

Under the Act the training boards operated on an industrial rather than on an occupational or regional basis. Operating on this basis, the boards were responsible for training all categories and types of employees in those business coming within a defined industrial sector (e.g. Air Transport and Travel).

The total provisions of the Industrial Training Act extended to all industries, commercial undertakings, and to all levels of employment in the United Kingdom.

DIAGRAM I

THE TRAINING FRAMEWORK OF
BRITISH INDUSTRY TRAINING BOARDS

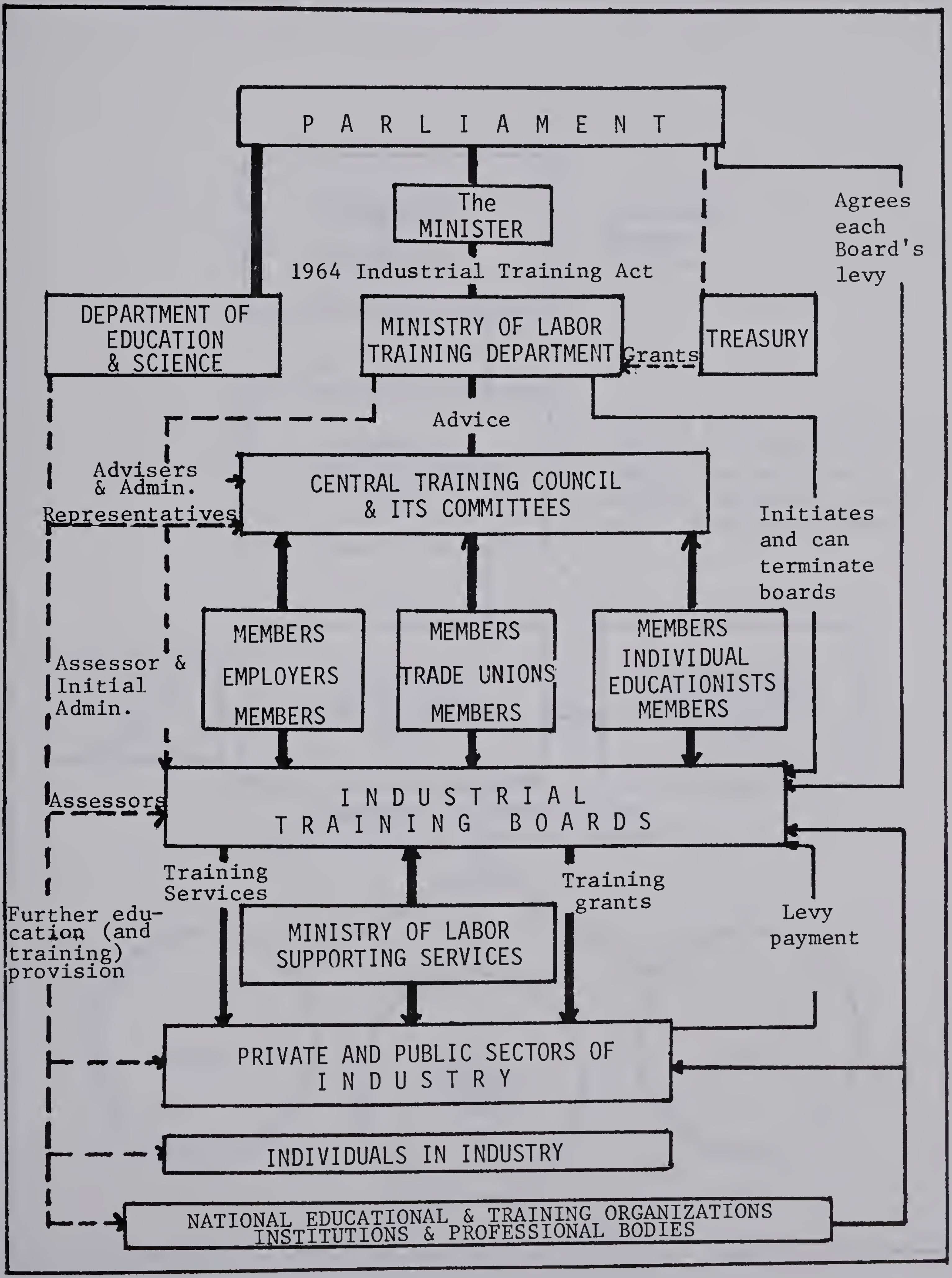
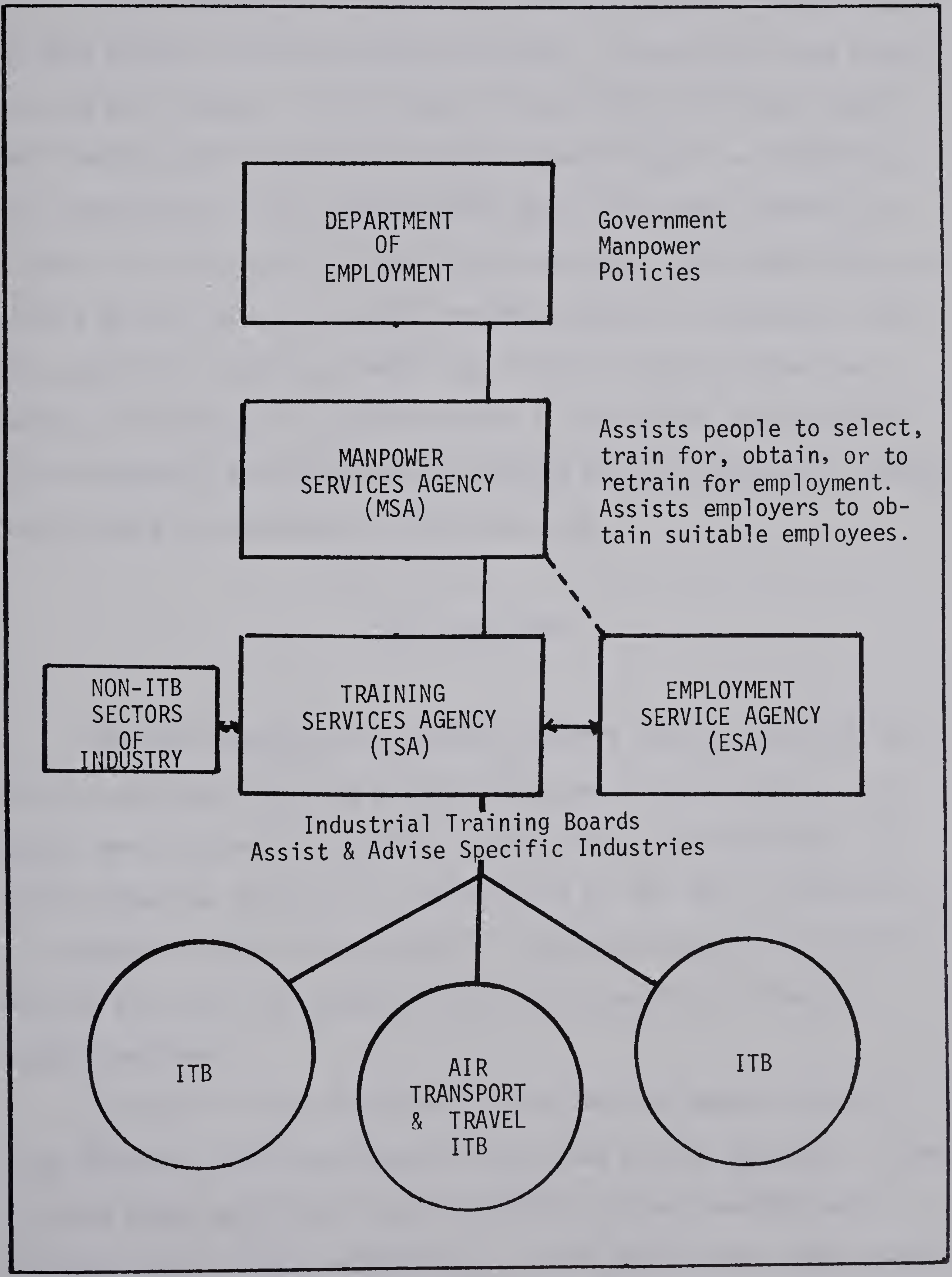

PARLIAMENT
The MINISTER
1964 Industrial Training Act
Agrees each Board's levy
DEPARTMENT OF EDUCATION & SCIENCE
MINISTRY OF LABOR TRAINING DEPARTMENT
Grants
TREASURY
Advice
Advisers & Admin.
Representatives
CENTRAL TRAINING COUNCIL & ITS COMMITTEES
Initiates and can terminate boards
MEMBERS EMPLOYERS MEMBERS
MEMBERS TRADE UNIONS MEMBERS
MEMBERS INDIVIDUAL EDUCATIONISTS MEMBERS
Assessor & Initial Admin.
Assessors
INDUSTRIAL TRAINING BOARDS
Training Services
Training grants
Levy payment
Further education (and training) provision
MINISTRY OF LABOR SUPPORTING SERVICES
PRIVATE AND PUBLIC SECTORS OF INDUSTRY
INDIVIDUALS IN INDUSTRY
NATIONAL EDUCATIONAL & TRAINING ORGANIZATIONS INSTITUTIONS & PROFESSIONAL BODIES

DIAGRAM II

ORGANIZATION OF INDUSTRY TRAINING BOARDS


DEPARTMENT OF EMPLOYMENT
Government Manpower Policies
MANPOWER SERVICES AGENCY (MSA)
Assists people to select, train for, obtain, or to retrain for employment. Assists employers to obtain suitable employees.
NON-ITB SECTORS OF INDUSTRY
TRAINING SERVICES AGENCY (TSA)
EMPLOYMENT SERVICE AGENCY (ESA)
Industrial Training Boards Assist & Advise Specific Industries
ITB
AIR TRANSPORT & TRAVEL ITB
ITB

III. FUNCTIONS OF THE INDUSTRIAL TRAINING BOARDS

It was the responsibility of the various industrial training boards to give effect to the provisions of the Act. In addition, these boards had two main duties. The first was to ensure that sufficient courses and training facilities were provided in their respective industries. The second was to make recommendations about the nature, length, and content of training for the different trade areas. This latter duty involved determining who should be trained (criteria for selection), how they should be trained, and what they should be taught (content and methods of training, the qualifications of instructors, the standards to be reached at the conclusion of training and the educational course(s) which should be associated with the training).

IV. LEVIES AND GRANTS

The main instrument by which the industry training boards derive their operational funds and set up courses was the levy system. All boards were required by the Act to impose a levy on the employers in their respective industries. The intention of this levy system was to: 1) increase the amount of training; 2) improve the quality of training; and, 3) distribute the costs of training in a particular industry between employers.

The last of these objectives implied that the amount raised in levy should be roughly equivalent to the total cost of training. If the levy was equal to the total cost of training, it was possible for a training board to repay each employer a grant equal to the amount spent

on providing training for the employees. If the trained personnel left to work for another employer, the original employer had the consolation of knowing that the industry as a whole had helped to meet that individual's training costs.

If no employers could be persuaded to undertake certain types of technical training, then the board was able to pay training grants to other technical institutions or colleges which offered the required courses (e.g. Southall College of Technology, Aircraft Maintenance Engineer training), or to establish their own training centers.

Having provided the funds to train personnel within an industry or in a related institution, the boards were charged with evaluating the training, recommending improvements, assisting in planning, and ensuring that certain standards were maintained.

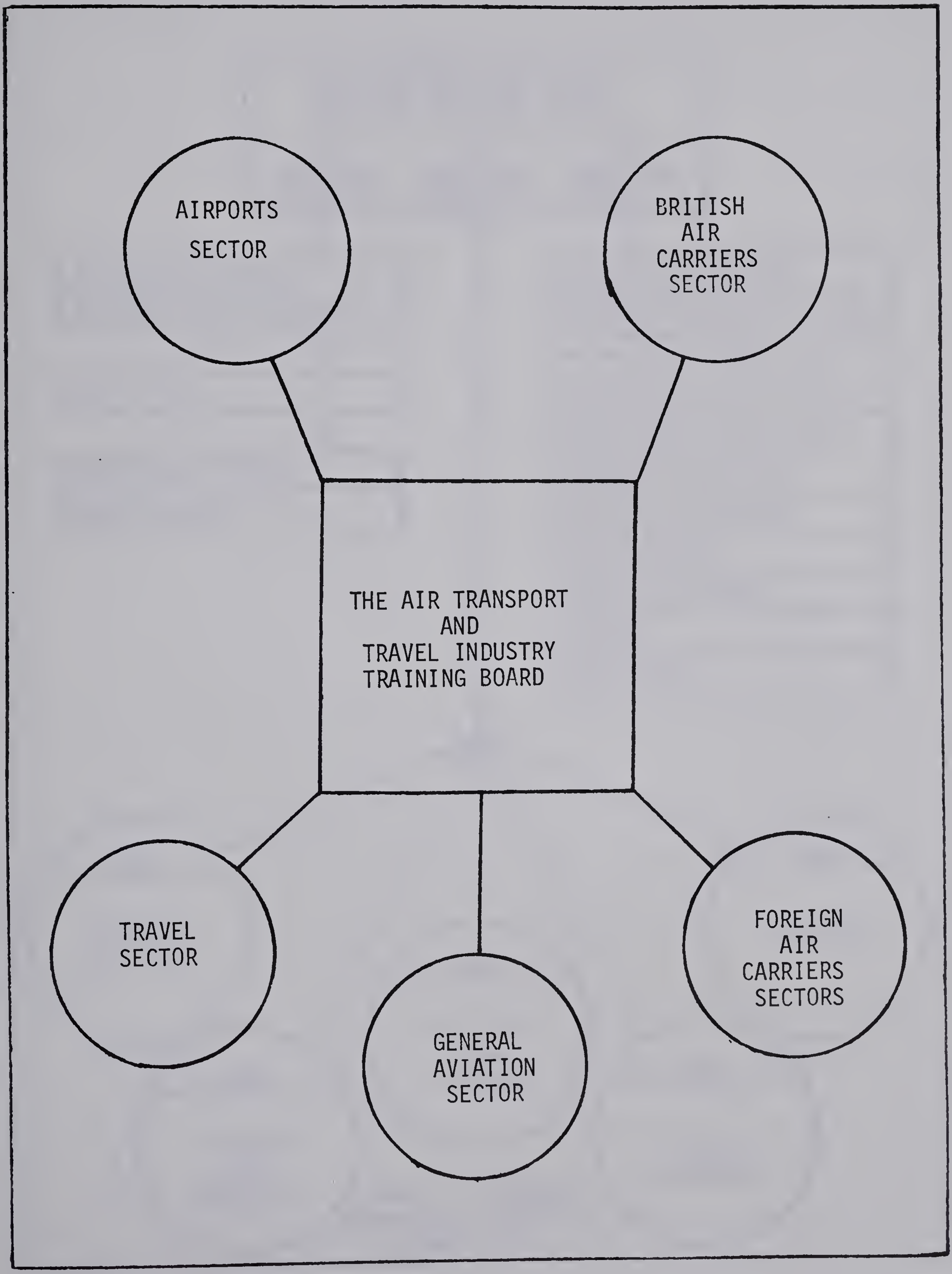
V. AIR TRANSPORT AND TRAVEL INDUSTRY TRAINING BOARD

The Air Transport and Travel Industry Training Board is one of twenty-four similar bodies which were established under the Industrial Training Act of 1964. It was established in 1967 as the Civil Air Transport Industry Training Board and was renamed in 1970 when travel agencies and tour operators were brought within the Board's scope.

At the present time, some 2,000 companies with about 3,000 establishments are within the Board's scope, representing about 110,000 people in 145 trades and occupations.

Board members are representatives of employers and employees of the industry or training area. The Air Transport and Travel Industry Training Board's headquarters is at Staines House, Middlesex where a permanent staff implements the decisions of the Board.

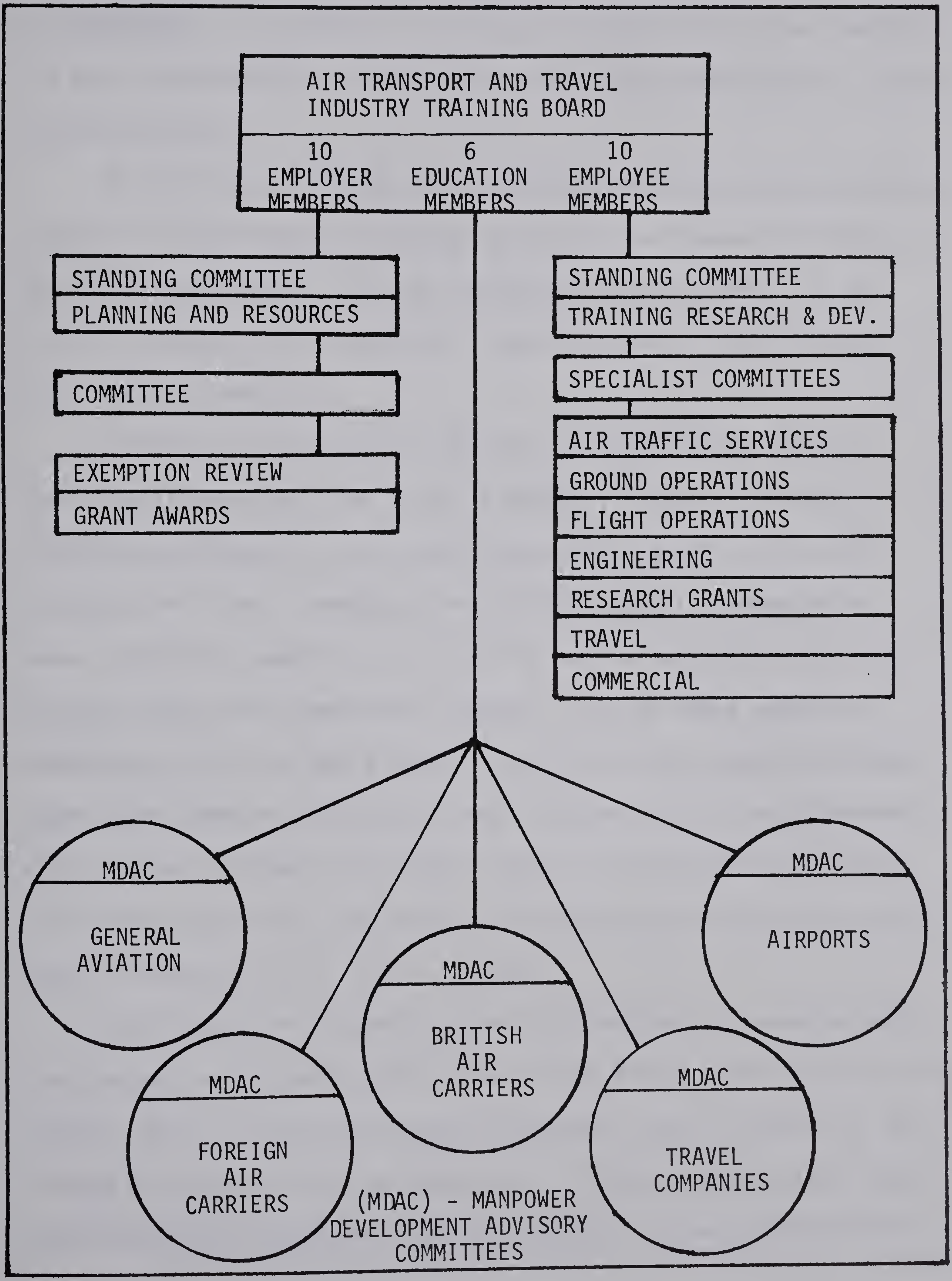
DIAGRAM III
THE BOARD AND
THE AIR TRANSPORT AND TRAVEL INDUSTRY


AIRPORTS SECTOR
BRITISH AIR CARRIERS SECTOR
THE AIR TRANSPORT AND TRAVEL INDUSTRY TRAINING BOARD
TRAVEL SECTOR
GENERAL AVIATION SECTOR
FOREIGN AIR CARRIERS SECTORS

[illegible]

DIAGRAM IV

COMMITTEE STRUCTURE OF THE AIR TRANSPORT AND TRAVEL INDUSTRY TRAINING BOARD



The Board

The Air Transport and Travel Industry Training Board consists of a chairman and twenty-six members appointed by the Secretary of State for Employment. Ten members are chosen from employers in the industry, ten are representatives of employees, and six are specialists in training and education.

The Board works through two standing committees, each consisting entirely of Board members and they deal with those areas within the Board's responsibility. The two standing committees are: (1) The Training, Research, and Development Committee and (2) The Planning and Resources Committee.

The work of the Training, Research, and Development Standing Committee is concerned with training matters, financial grants for training, and research in the broad occupational groups of the air transport and travel industry. Any detailed work is conducted by seven specialist committees, six dealing with occupational groups and one which deals with grants for research. All of these specialist committees consist of Board members and persons with specialized knowledge drawn from the industry, as well as Board staff - an arrangement which enables the Board to evolve a policy in relation to the industry's needs and assists the Board in influencing training over the full range of work activities in the industry.

The Planning and Resources Standing Committee is concerned with the strategic and planning activities of the Board, staff and financial matters, advice to the Board regarding grants, rates of levy, and conditions of levy exclusion or exemption. It also maintains links with the Training Services Agency and other boards. It has one committee

composed of Board members which deals with reviews of exemption for the training levy, and another committee consisting of Board members and other persons drawn from the Manpower Development Advisory Committee which deals with the awarding of training grants.

Manpower Development Advisory Committee

There are five Manpower Development Advisory Committees (MDAC), each one under the chairmanship of a board member. They have been set up to provide links with the air transport and travel industry, and jointly they develop and test the board's policy in relation to manpower resourcing matters. These committees are representative of the industry and deal with the implementation of the Air Transport and Travel Industry Training Board's five year plan as well as the procedures of levy, exemption, and grants in relation to each of five sectors into which the industry has been divided for operational convenience (see diagram p.23).

The Board Staff

The Board's decisions and directions are accomplished by a staff of some 80 people, headed by a director. The work of the staff falls into four main areas:

1) training advisory service
2) resource services
3) research and development
4) administration

Their activities are centred around four main aims:

1) National Level - to help ensure that the United Kingdom has an efficient air transport and travel industry.

2) Industry Level - to improve manpower development within the industry.
3) Company Level - to improve the planning, management, and effectiveness of training.
4) Individual Level - to encourage the use of schemes to train individuals for their current jobs and to assist them in gaining new skills and knowledge.

To achieve these aims, the Board concentrates upon manpower planning, research into training, the establishment of systematic training and development schemes, and the publication of recommendations for training in certain occupations within the air transport and travel industry. Grants are provided to promote training for management development as well as for other approved occupational training. Grants are also provided for group training schemes designed to serve a number of small companies so that by pooling their financial resources they provide a workable, shared-training facility.

Levy and Grants

The Air Transport and Travel Industry Training Board applies a system of levy, offset by a general grant, based upon the agreement with the companies to adopt systematic training and development related to their company objectives, the needs of their employees, and the overall manpower and training needs of the industry. The levy is based on these rates:

British carriers (paid)	2.0% of their payroll
Other air transport	1.5% of their payroll
Travel companies	1.0% of their payroll

Employers with fewer than sixteen employees were exempted from the levy.

General Levy Exemption Policy

The levy exemption scheme became effective on April 1st, 1975. By meeting certain training criteria drawn up in conjunction with the industry, employers may qualify for abatement of exemption for levy. Depending on the criteria which these industries meet, they could qualify for levy abatement on a rising scale until, by meeting all criteria, they could be completely exempt. Details are set out in the Board's Guide to Levy Exemption and Grants.

Board Courses

The Board also offers the following courses:

1) Developing Interactive Skills.
2) Introduction to Manpower Planning.
3) Training Techniques for Information Handling.
4) Preparing Instructional Objectives.
5) Travel Agency Sales and Marketing.

Research Projects

A training research bulletin containing reports on projects in progress and those completed has been published twice a year.

VI. SUMMARY OF CHAPTER II

The whole concept of the direct involvement in training by the industries concerned arose because of the manifestation of a definite need. This need was to secure and maintain a well-trained pool of technical workers which would minimize the shortages of skilled labor within British industry.

From this desire to assure productivity and a stable labor supply, the British Government formulated the Industrial Training Act and made it the legal framework for training by industry.

From the Industry Training Act, the Air Transport and Travel Industry Training Board evolved and became a highly sophisticated, training-oriented, heavily regulated organization. From its inception, the primary goal of the Air Transport and Travel Industry Training Board has been to train, utilize, and develop manpower in the most effective way possible. The process of securing this goal is on-going, and the achievements gained become evident when the training of Aircraft Maintenance Engineers under the air transport part of the Industry Training Board is studied in depth.

CHAPTER III

TRAINING INSTITUTIONS INVOLVED AND DERIVATION OF TRAINING COSTS

I. INTRODUCTION

During the research into the Air Transport and Travel Industry Training Board and into the costs of training Aircraft Maintenance Engineers in Alberta and the United Kingdom, large amounts of background information and numerical cost data were collected and compiled.

To allow the reader to gain some perspective about the information collected, a short description of the technical institution and of the companies involved in the training is presented.

The institution and the three companies are:

1) Southern Alberta Institute of Technology,
   Calgary, Alberta, Canada.
2) Airline Engineering Limited,
   Luton Airport, Bedfordshire, England.
3) British Airways,
   London Heathrow Airport, London, England.
4) British Caledonian Airways Limited,
   London Garwick Airport, London, England.

It should be noted that all of the training institutions and companies involved in the study differed somewhat in their scope of training. Nevertheless, they are all inter-related, as they all produce a trainee capable of becoming an Aircraft Maintenance Engineer.

II. SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY

The Southern Alberta Institute of Technology is the only technical institute in Alberta which offers training in aircraft maintenance.

The program offered is of sixty-four weeks' duration consisting of five quarters. The content of the courses within the training program follows the Department of Transport curriculum guidelines as outlined in their handbook dealing with licensing of trained personnel.

The training towards obtaining an Aircraft Maintenance Engineer License may be accomplished in two ways in Alberta:

(1) Southern Alberta Institute of Technology Program - 64 weeks of technical training and successful graduates are credited with 18 months towards the 36 months of approved experience required for licensing. The technical examinations required for licensing may be attempted after graduation from the Southern Alberta Institute of Technology.

(2) Apprenticeship Program - 36 months of practical training supervised by a licensed Aircraft Maintenance Engineer in an approved aircraft repair shop. After this time, licensing examinations may be attempted for the Aircraft Maintenance Engineer License.

An Aircraft Maintenance Engineer License is issued for one or more of the following categories:

Fixed Wing Aircraft

Category "A" - certification of aircraft (airframe and engine) before flight.

Category "B" - certification of aircraft (excluding engine) after overhaul or major repairs.

Rotary Wing Aircraft

Category "R" - certification of aircraft (airframe and engine) before flight.

Category "B" - certification of aircraft (excluding engine) after overhaul or major repairs.

Engines

Category "D" - certification after overhaul or major repairs.

Propellers

Category "P" - certification after overhaul or major repairs.

In addition, Section XIV of the Aircraft Maintenance Engineer License provides for the listing of equipment, such as pressurized or turbine-powered aircraft, for which the Aircraft Maintenance Engineer has qualified, but which is not eligible for an endorsement on an Aircraft Maintenance Engineer License. For qualification under Part XIV, the Aircraft Maintenance Engineer must have been trained and examined under a Department of Transport accredited course of training or a manufacturer's training program acceptable to the Department of Transport.

III. TRAINING IN THE UNITED KINGDOM

The training of Aircraft Maintenance personnel in the United Kingdom differs from the Alberta system in that many of the licensing aspects and funding for training are not the same.

All licensing of Aircraft Maintenance personnel in the United Kingdom comes under the jurisdiction of the Civil Aviation Authority. This department must approve any system of training to be used and any scheduling of examinations that a student must sit for.

The Civil Aviation Authority does delegate some authority to those within an aircraft organization. The chief engineer decides the competency of any subordinate engineer, and the quality manager sets the appropriate standards of workmanship.

Skill designation and task definition for Aircraft Maintenance Engineers differ from Canada and the United Kingdom in that the trade unions of the United Kingdom have designated that only two categories of workers exist - skilled and unskilled. The designation of skilled worker has been sub-divided into five categories:

1) technician
2) craftsman
3) skilled operative
4) skilled laborer
5) laborer

Skilled workers in the maintenance and repair of aircraft in the United Kingdom are either classified as Aircraft Maintenance Craftsmen or Aircraft Maintenance Technicians. In this study Aircraft Maintenance Technician and Aircraft Maintenance Engineer are assumed to mean the same. (Assumptions of the Study #8, p.11.)

The three British companies involved in the training of Aircraft Maintenance Engineers, and which were researched in this study, are Airline Engineering Limited, British Airways, and British Caledonian Airways Limited.

IV. AIRLINE ENGINEERING LIMITED

Monarch Airlines of Great Britain is a transportation company

which operates a number of aircraft and is extensively involved in the carrying of passengers, air cargo, and travel charters. Its fleet of aircraft is serviced and maintained by Airline Engineering Limited, operated as a subsidiary aircraft maintenance company by Monarch Airlines.

It was a need for a supply of well-trained aircraft maintenance personnel that prompted Monarch Airlines, Britannia Airways, McAlpine Aviation, Luton Aviation, Eagle Aircraft Services, and Victor Aircraft Engineering to form a training group in 1971. Each of the six companies have one share in the training company, and each company provides one director for the governing body.

The original training scheme undertaken by the training group was to take ex-military personnel and train them to become licensed engineers. Prior to 1971, an Aircraft Maintenance Engineer shortage existed because an apprentice wanting to obtain training toward licensing had to have a license in order to be hired. This paradoxical situation demanded a resolution. A system for training Aircraft Maintenance Engineers was definitely needed.

In the initial stages of development, the group of six companies assumed full developmental and financial responsibility for the training scheme. The Air Transport and Travel Industry Training Board became involved in the training when the government wished to see more retraining of adult ex-military personnel. To see this endeavor brought about, the Air Transport and Travel Industry Training Board was forthcoming with financial assistance for a new training center.

The training center not only trained Aircraft Maintenance Engineers for the group, but took in students from other companies, British or foreign, wishing to have their employees trained.

Those companies within the group enjoyed special rates for training apprentices to assure a good supply of apprentices and to keep each group member sending personnel to be trained.

V. BRITISH AIRWAYS

Until 1971, the main British civil aviation effort was in the hands of two corporations - British European Airways (B.E.A.) and British Overseas Aircraft Corporation (B.O.A.C.). The Civil Aviation Act of 1971 created the British Airways Board and in 1972 this Board assumed ownership and control of both B.E.A. and B.O.A.C.

In 1974, these two state corporations were dissolved and became known as British Airways. The airline is a government-owned operation but is operated as a private company. It is a commercial, government-held, shareholding company with limited company partners.

Seventy-five percent of all British commercial flying is done by British Airways. The company operates international services for passengers, cargo, and mail to 88 countries and has one of the most extensive networks of routes for any airline in the world.

The company employs some 55,000 staff world-wide, many of whom are Aircraft Maintenance Engineers. A large percentage of the company's engineers are trained within the company. They begin as apprentices and are trained at the British Airways Apprentice Training Center located near Heathrow Airport, London.

VI. BRITISH CALEDONIAN AIRWAYS LIMITED

British Caledonian Airways Limited operates more than 500 scheduled services to 25 countries and is the British flag-carrying airline to South America, West and Central Africa, parts of North Africa, and to Houston, Texas. British Caledonian also operates an extensive network of scheduled services in both the United Kingdom and continental Europe.

The airline is privately owned and operates two main fleets of aircraft - 17 short-haul jets and 10 long-haul jets - on inter-continental routes.

The company employs 950 people at the London-Gatwick engineering maintenance and repair base.

In order to handle the large number of company aircraft, British Caledonian Airways Limited started an apprentice and student training scheme in 1960.

VII. DERIVATION OF TRAINING COSTS

Since the training costs for Aircraft Maintenance Engineers are vital to the study, the method by which those expenditures were determined, the amounts of money involved, and the significance of the cost results are very important to the study.

The approach to determining the training costs was fundamentally simple. First, those expenditures which were associated with the training activity were established within an account period. The account period is usually one year (January 1-December 31), and could be subdivided into shorter periods of time such as months, weeks, days, or

even hours, depending on the needs of the study.

It should be noted that many of the expenditures in industry directly relate to the productive activity, for if the quantity of production rises, the costs will also rise in accordance with the quantity produced. Should production fall, then the costs related to quantity will also fall.

However, training costs do not have that direct relationship to the productive output of an industry. The costs of training are said to be an overhead cost and diminish to an extent as the quantity of trainees taken in by the industry is increased.

Cost analysts have developed various procedures for associating the costs of training with those of production, and these procedures of apportionment and allocation are based on the idea of sharing the total costs evenly. These procedures have led to highly complex accounting procedures and formulae which can lead to misunderstanding and confusion.

The technique employed in this study was a reasonably simple method of providing the general training costs for the aircraft industry over a one-year period.

It could be suggested that a standardized accounting procedure for training costs would have been extremely helpful for the accurate compilation of the cost data in the study. However, no such standardized method appeared to exist, and in order to arrive at an accounting procedure which would satisfy the requirements of the study, three definitive actions were taken:

1) A list of training costs which were likely to be incurred was formulated.
2) Cost divisions were identified and grouped for easier study

(direct and indirect).

3) Cost units were adopted which would enable the reader to easily comprehend the quantity of cost (total cost of training one Aircraft Maintenance Engineer trainee).

The materials used in training varied considerably according to the type of industry concerned and the number of trainees involved. Some costs such as personnel, building, administration, equipment, and depreciation were common to all industries. Some costs were exclusive to a certain industry, for manufacturing differs from those costs involved in the services and trading industries.

The following list was an attempt to group those costs which relate to training, whether they are for industry or institutions -

1. Personnel Costs
    (a) wages - ordinary time
    (b) wages - overtime
    (c) salaries - ordinary time
    (d) salaries - overtime
    (e) wages - casual, part-time
    (f) commissions
    (g) bonuses
2. Personnel Costs - Other Payments
    (a) health insurance
    (b) pension fund contributions
    (c) fees to consultants, auditors, counsel, etc.
    (d) accommodation (hotels)
    (e) meals
    (f) miscellaneous

3. Fees Paid for External Training
    (a) fees paid for cooperative training
    (b) fees paid for industrial training
    (c) fees paid for group training
    (d) fees paid to research establishments
    (e) fees paid to training centers (private)
    (f) fees paid to training centers (public)
    (g) fees paid to consultants
    (h) educational fees to technical colleges
    (i) educational fees to local school
    (j) educational fees to universities
4. Building Costs and Services
    (a) new construction and renovation
    (b) rent
    (c) utilities - water, electricity, telephone, oil, gas
    (d) repairs and maintenance
    (e) security
    (f) fire prevention
5. Production Costs
    (a) machine and equipment acquisition and replacement
    (b) machine and tool rental
    (c) royalties
    (d) machine repair and maintenance
6. Administration Costs
    (a) printing and stationery
    (b) postage, telegrams, telex
    (c) telephone

- (d) newspapers, periodicals, trade publications
- (e) subscriptions
- (f) furniture and office machine repair and maintenance
- (g) meetings and speakers
- (h) excursions

7. Insurance
    - (a) employer's liability
    - (b) accident
    - (c) fire
    - (d) theft
    - (e) bonding
    - (f) cash in transit
    - (g) vehicle
    - (h) property and equipment
8. Transportation and Travel
    - (a) vehicle purchase
    - (b) vehicle licensing
    - (c) vehicle repair and maintenance
    - (d) gas and oil
    - (e) travel expenses and fares
9. Depreciation and Other Provisions
    - (a) land and buildings
    - (b) plant and machinery
    - (c) vehicles
    - (d) furniture and office machines
    - (e) patents and trademarks
10. Purchasing and Selling Expenses

   - (a) advertising - television, radio, newspapers
   - (b) commissions to staff
   - (c) commissions to others (non-staff)
   - (d) shipping
   - (e) customs duties

11. Adjustment or Reciprocal Accounts
12. Materials and Goods
    - (a) materials at actual cost
    - (b) materials at production cost
    - (c) specialized tools
13. Computer Time.

This preceding information was based on a list provided in the Industry Training Board Manual (pp. 95-98).

VIII. SUMMARY OF CHAPTER III

For the sake of effective cost-control and to realize the best training return for the money spent, a quantitative and qualitative analysis of the costs of all technical training should be undertaken.

This type of analysis would involve the breaking down of all the technical training costs incurred into precise categories where they can be minutely scrutinized. Unfortunately, a standardized accounting procedure which can be universally employed for studies of this kind has not yet evolved or is unknown to the writer.

It would therefore seem a judicious move by those concerned in technical training funding to be at the forefront in creating and adopting a system which would provide a real and positive means of

analyzing the costs of training.

With such a system, those in the public and private sector could view the costs and realize that such expenditures for training are not really an expense but a worthwhile investment in people which yields a high rate of return.

CHAPTER IV

COSTS OF TRAINING AND THEIR COMPARISON

The costs portion of the study began with the reduction of the total time it took to produce an Aircraft Maintenance Engineer into the years of study (usually three or four). Then the training year was further reduced to the average number of weeks per year that the trainee was either receiving off-job (theoretical) training or was working in an on-job (practical) situation.

Since the institution and companies involved in the study used different amounts of time for off-job (theoretical) training and on-job (practical) training, an adjustment was made in the attempt to equalize the costs of instruction over a 48-week, full-training year period.

What must be noted is that when an apprentice is maintaining or repairing an aircraft,his/her labor is usually charged to the customer. The actual work done is either at a reduced charge, sliding scale, or full journeyman rate. Whatever the scale of charges, there is usually some financial return to the company for the trainee's time and effort.

EXAMPLE - Southern Alberta Institute of Technology.

YEAR 1 - The trainee was in off-job (theoretical) training for the whole of his/her first year. Therefore, the institution did not realize any financial return and bore the full cost of training (100%).

YEAR 2 - The trainee was in the off-job (theoretical) part of his/her training for only 26 weeks out of a possible 48-week training-work year. The cost to the institution

was then $\frac{\text{26 weeks (off-job) theoretical}}{\text{48 weeks training-work year}} = .54$

Therefore, 0.54 or 54% of the total training costs for Year 2 were borne by the institution.

TABLE 1

AIRCRAFT MAINTENANCE ENGINEER TRAINING

LENGTH OF PROGRAM

INSTITUTION OR COMPANY : Airline Engineering Limited,
Luton Airport,
Luton, Bedfordshire.

COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
Technician	3 weeks - Introduction 12 weeks - theory 33 weeks - on-job	12 weeks - theory 36 weeks - on-job	12 weeks - theory 36 weeks - on-job	4 weeks - theory (nightclasses) 44 weeks - on-job	
		FOUR	YEARS		

TABLE 2

AIRCRAFT MAINTENANCE ENGINEER TRAINING

LENGTH OF PROGRAM

INSTITUTION OR COMPANY :	Southern Alberta Institute of Technology, 1301 - 16th Avenue N.W., Calgary, Alberta. T2M OL4				
COURSE DURATION	YEAR I	YEAR 2		YEAR 3	
Aircraft Maintenance Engineer	← Southern Alberta Institute of Technology →		← In Industry →		Write Technical Examinations for "A" or "R" License
	38 weeks	26 wks.	22 wks.	48 weeks	
	← Off-Job (theoretical) →		← On-Job (practical) →		Further Ratings
	← THREE YEARS →				

TABLE 3

AIRCRAFT MAINTENANCE ENGINEER TRAINING

LENGTH OF PROGRAM

INSTITUTION OR COMPANY :	British Caledonian Airways Limited, Gatwick Airport, Horley, Surrey				
COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
Apprentice Technician	Crawley Technical College Off-Job	Day Release for Short Courses On-Job	On-Job	On-Job	University
	FOUR YEARS				
Apprentice Craftsman	Crawley Technical College Off-Job	On-Job	On-Job		
	THREE YEARS				

TABLE 4
AIRCRAFT MAINTENANCE ENGINEER TRAINING
LENGTH OF PROGRAM

INSTITUTION OR COMPANY :	British Airways, Speedbird House, Heathrow Airport, Hounslow, Middlesex.					
COURSE DURATION	YEAR I	YEAR 2		YEAR 3	YEAR 4	
Apprentice Technician	← British Airways Training College →		← Short Courses →			
	48 weeks	24 wks.	24 wks.	48 weeks	48 weeks	
	← Off-Job →		← On-Job →		← On-Job Totally →	2yr. industry 2½ study 4½ years DEGREE
	← FOUR YEARS →					
Apprentice Craftsman	← British Airways Training College →					
	← Off-Job →		← On-Job →			
	← THREE YEARS →					

TABLE 5

AIRCRAFT MAINTENANCE ENGINEER TRAINING PROGRAM LENGTH COST ADJUSTMENT

INSTITUTION OR COMPANY :	Airline Engineering Limited, Luton Airport, Bedfordshire.	COST ADJUSTMENT TO INSTITUTION OR COMPANY **		**assuming 48-week working year.	
COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
AIRCRAFT MAINTENANCE ENGINEER	15 weeks Off-Job ↔	12 weeks Off-Job ↔	12 weeks Off-Job ↔	4 weeks Night Classes ↔	
	$\frac{15}{48}$ = .31 COST to Company	$\frac{12}{48}$ = .25 COST to Company	$\frac{12}{48}$ = .25 COST to Company	$\frac{4}{48}$ = .08 COST to Company	

TABLE 6

AIRCRAFT MAINTENANCE ENGINEER TRAINING
PROGRAM LENGTH COST ADJUSTMENT

COST ADJUSTMENT TO INSTITUTION OR COMPANY **

INSTITUTION OR COMPANY : Southern Alberta Institute of Technology,
1301 - 16th Avenue N.W.
Calgary, Alberta. T2M 0L4

** assuming 48-week working year.

COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
AIRCRAFT MAINTENANCE ENGINEER	38 weeks Off-Job	26 weeks Off-Job			
	FULL COST to Institution	$\frac{26}{48}$ = .54 COST to Institution	NO COST to Institution	NO COST to Institution	

TABLE 7

AIRCRAFT MAINTENANCE ENGINEER TRAINING PROGRAM LENGTH COST ADJUSTMENT

COST ADJUSTMENT TO INSTITUTION OR COMPANY **

INSTITUTION OR COMPANY : British Caledonian Airways Limited,
Gatwick Airport,
Horley, Surrey.

** assuming 48-week working year

COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
AIRCRAFT MAINTENANCE ENGINEER	40 weeks Off-Job ↔				
	FULL COST to Company	NO COST to Company	NO COST to Company	NO COST to Company	

TABLE 8

AIRCRAFT MAINTENANCE ENGINEER TRAINING

PROGRAM LENGTH COST ADJUSTMENT

COST ADJUSTMENT TO INSTITUTION OR COMPANY**

INSTITUTION OR COMPANY : British Airways,
Speedbird House,
Heathrow Airport, Hounslow, Middlesex.

** assuming 48-week working year

COURSE DURATION	YEAR I	YEAR 2	YEAR 3	YEAR 4	
AIRCRAFT MAINTENANCE ENGINEER	40 weeks Off-Job	24 wks. Off-Job			
	FULL COST to Company	$\frac{24}{48}$ = .50 COST to Company	NO COST to Company	NO COST to Company	

To find the cost of training one Aircraft Maintenance Engineer, the study broke the training programs into two cost units; those costs which were direct (instructional) and those which were indirect (operational). The data collected does not represent a minutely detailed breakdown but is more of a compilation of the average costs of the one specific area (e.g. salaries of instructors). The lack of detailed data was due to the limitations imposed upon the study (see Limitations, p. 9).

It was with those limitations in mind that the study went to a cost formula of:

$$C = \frac{A + R}{I}$$

where C = costs of training

A = direct instructional costs (per trainee per annum)

R = indirect operational costs (per annum)

I = intake (average number of trainees per annum)

NOTE: (1) The cost of training per trainee decreases as the intake figure increases. The decrease is attributable to a greater utilization of physical facilities, instructional staff, and material.

(2) The Air Transport and Travel Industry Training Board trainee cost contribution will be subtracted from the total costs of training.

TABLE 9

AIRCRAFT MAINTENANCE ENGINEER TRAINING

ESTIMATED EXPENDITURES ON TRAINING (FULL TRAINING YEAR)

Airline Engineering Limited		A.E.L.
"A" INSTRUCTIONAL COSTS DIRECT	SALARIES (INSTRUCTORS')	£ 10,800.00
	TEXT BOOKS	12.00
	MATERIALS AND SUPPLIES	192.00
	EQUIPMENT AND TOOLS	100.00
	OTHER COSTS	6.00
TOTAL		£ 11,110.00
"R" OPERATIONAL COSTS INDIRECT	SALARIES (TRAINEES')	24,053.00
	SALARIES (ADMINISTRATION)	7,600.00
	SALARIES (SUPPORT PERSONNEL)	1,800.00
	MATERIALS AND SUPPLIES	200.00
	LIBRARY AND STAFF	NIL
	HEALTH SERVICES	NIL
	TRANSPORTATION	NIL
	HOUSING	NIL
	PLANT OPERATION AND MAINTENANCE	69.00*
	EQUIPMENT REPAIR AND MAINTENANCE	45.00
	RENTAL AND PURCHASE	NIL
	INSURANCE	Included with *
	RESEARCH AND DEVELOPMENT	10.00
	COMPUTER TIME	NIL
	OTHER COSTS	800.00
TOTAL		£ 34,577.00
"I" TRAINEE INTAKE PER ANNUM (AVERAGE)		14
COST RETURN TO INSTITUTION OR COMPANY		£480x14 = £ 6,720

TABLE 10

AIRCRAFT MAINTENANCE ENGINEER TRAINING

ESTIMATED EXPENDITURES ON TRAINING (FULL TRAINING YEAR)

Southern Alberta Institute of Technology		S.A.I.T.
"A" INSTRUCTIONAL COSTS DIRECT	SALARIES (INSTRUCTORS')	$208,000.00
	TEXT BOOKS	120.00
	MATERIALS AND SUPPLIES	4,536.00
	EQUIPMENT AND TOOLS	875.00
	OTHER COSTS	435.00
TOTAL		$213,966.00
"R" OPERATIONAL COSTS INDIRECT	SALARIES (TRAINEES')	NIL
	SALARIES (ADMINISTRATION)	$37,600.00
	SALARIES (SUPPORT PERSONNEL)	28,300.00
	MATERIALS AND SUPPLIES	Included with *
	LIBRARY AND STAFF	118.00
	HEALTH SERVICES	200.00
	TRANSPORTATION	280.00
	HOUSING	NIL
	PLANT OPERATION AND MAINTENANCE	44,231.00 *
	EQUIPMENT REPAIR AND MAINTENANCE	827.00
	RENTAL AND PURCHASE	Included with *
	INSURANCE	Included with *
	RESEARCH AND DEVELOPMENT	NIL
	COMPUTER TIME	600.00
	OTHER COSTS	Not Available
TOTAL		$112,156.00
"I" TRAINEE INTAKE PER ANNUM (AVERAGE)		60
COST RETURN TO INSTITUTION OR COMPANY		NIL

TABLE 11

AIRCRAFT MAINTENANCE ENGINEER TRAINING

ESTIMATED EXPENDITURES ON TRAINING (FULL TRAINING YEAR)

British Caledonian Airways Limited		B.C.
"A" INSTRUCTIONAL COSTS DIRECT	SALARIES (INSTRUCTORS')	£ 65,000.00
	TEXT BOOKS	18.00
	MATERIALS AND SUPPLIES	144.00
	EQUIPMENT AND TOOLS	90.00
	OTHER COSTS	100.00
TOTAL		£ 65,352.00
"R" OPERATIONAL COSTS INDIRECT	SALARIES (TRAINEES')	36,288.00
	SALARIES (ADMINISTRATION)	8,500.00
	SALARIES (SUPPORT PERSONNEL)	2,000.00
	MATERIALS AND SUPPLIES	150.00
	LIBRARY AND STAFF	NIL
	HEALTH SERVICES	NIL
	TRANSPORTATION	NIL
	HOUSING	NIL
	PLANT OPERATION AND MAINTENANCE	18,000.00 *
	EQUIPMENT REPAIR AND MAINTENANCE	220.00
	RENTAL AND PURCHASE	NIL
	INSURANCE	Included with *
	RESEARCH AND DEVELOPMENT	NIL
	COMPUTER TIME	Not known
	OTHER COSTS	NIL
TOTAL		£ 65,158.00
"I" TRAINEE INTAKE PER ANNUM (AVERAGE)		18
COST RETURN TO INSTITUTION OR COMPANY		£300x18 =£ 5,400

TABLE 12

AIRCRAFT MAINTENANCE ENGINEER TRAINING

ESTIMATED EXPENDITURES ON TRAINING (FULL TRAINING YEAR)

British Airways		B.A.
"A" INSTRUCTIONAL COSTS DIRECT	SALARIES (INSTRUCTORS')	£142,800.00
	TEXT BOOKS	525.00
	MATERIALS AND SUPPLIES	1,750.00
	EQUIPMENT AND TOOLS	1,645.00
	OTHER COSTS	2,000.00
TOTAL		£148,720.00
"R" OPERATIONAL COSTS INDIRECT	SALARIES (TRAINEES')	352,800.00
	SALARIES (ADMINISTRATION)	97,500.00
	SALARIES (SUPPORT PERSONNEL)	41,000.00
	MATERIALS AND SUPPLIES	8,750.00
	LIBRARY AND STAFF	3,850.00
	HEALTH SERVICES	4,450.00
	TRANSPORTATION	2,000.00
	HOUSING	Covered by charge to trainee
	PLANT OPERATION AND MAINTENANCE	158,320.00 *
	EQUIPMENT REPAIR AND MAINTENANCE	24,000.00
	RENTAL AND PURCHASE	Not known
	INSURANCE	Included with *
	RESEARCH AND DEVELOPMENT	NIL
	COMPUTER TIME	Not known
	OTHER COSTS	1,000.00
TOTAL		£693,670.00
"I" TRAINEE INTAKE PER ANNUM (AVERAGE)		175
COST RETURN TO INSTITUTION OR COMPANY		NIL

Weighting Factors - Currency Adjustment

The average yearly rate of exchange of Canadian and British currency as at January 1st of each year was:

YEAR	U.K.	CANADIAN
1978 *	2.31	$1.00
1977	1.72	$1.00
1976	2.06	$1.00
1975	2.31	$1.00
1974	2.20	$1.00
1973	2.35	$1.00
1972	2.53	$1.00

* Due to extreme British and Canadian currency fluctuations, the rate of exchange was averaged up to the final proof of the study.

The above figures were derived from:

The Royal Bank of Canada,
6 Lothbury C.2,
London,
United Kingdom.

TABLE 13

AIRCRAFT MAINTENANCE ENGINEER TRAINING

DIRECT INSTRUCTIONAL COSTS

A - DIRECT INSTRUCTIONAL COSTS 1st YEAR COURSE

*Amounts are Estimated
**Program Length Cost Adjustments are applied.

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
COST	$213,966.00 x 1.0 = $213,966.00	£11,110.00 x .31 =£3,444.00	£148,720.00 x 1.0 =£148,720.00	£65,352.00 x 1.0 =£65,352.00
COST IN CANADIAN CURRENCY £1 British = $2,31 Canadian	$213,966.00	£3,444.00 x 2.31 = $7,956.00	£148,720.00 x 2.31 = $343,543.00	£65,352.00 x 2.31 = $150,963.00

TABLE 14

AIRCRAFT MAINTENANCE ENGINEER TRAINING

INDIRECT OPERATIONAL COSTS

R - INDIRECT OPERATIONAL COSTS 1st YEAR COURSE

*Amounts are Estimated
**Program Length Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY,	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE,	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT,
COST	$112,156.00 x 1.0 =$112,156.00	£34,577.00 x .31 =£10,719.00	£693,670.00 x 1.0 =£693,670.00	£65,158.00 x 1.0 =£65,158.00
COST IN CANADIAN CURRENCY £1 British = $2.31 Canadian	$112,156.00	£10,719.00 x 2.31 =$24,760.00	£693,670.00 x 2.31 =$1,602,378.00	£65,158.00 x 2.31 =$150,515.00

TABLE 15

AIRCRAFT MAINTENANCE ENGINEER TRAINING
DIRECT INSTRUCTIONAL COSTS

A - DIRECT INSTRUCTIONAL COSTS 2nd YEAR COURSE

*Amounts are Estimated
**Program Length Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
COST	$213,966.00 x .54 = $115,541.00	£11,110.00 x .25 =£2,777.00	£148,720.00 x .50 =£74,360.00	NO COST
COST IN CANADIAN CURRENCY £1 British = $2,31 Canadian	$115,541.00	£2,777.00 x 2.31 = $6,415.00	£74,360.00 x 2.31 = $171,771.00	NO COST

TABLE 16

AIRCRAFT MAINTENANCE ENGINEER TRAINING

INDIRECT OPERATIONAL COSTS

R - INDIRECT OPERATIONAL COSTS 2nd YEAR COURSE

*Amounts are Estimated
**Program Length Cost Adjustments are applied.

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY,	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE,	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT,
COST	$112,156.00 x .54 =$60,564.00	£34,577.00 x .25 =£8,644.00	£693,670.00 x .50 =£346,835.00	NO COST
COST IN CANADIAN CURRENCY £1 British = $2.31 Canadian	$60,564.00	£8,644.00 x 2.31 =$19,968.00	£346,835.00 x 2.31 =$801,189.00	NO COST

TABLE 17
AIRCRAFT MAINTENANCE ENGINEER TRAINING
DIRECT INSTRUCTIONAL COSTS

A - DIRECT INSTRUCTIONAL COSTS 3rd YEAR COURSE

* Amounts are Estimated
**Program ength Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
COST	NO COST	£11,110.00 x .25 =£2,777.00	NO COST	NO COST
COST IN CANADIAN CURRENCY £1 British = $2,31 Canadian	NO COST	£2,777.00 x 2.31 =$6,415.00	NO COST	NO COST

TABLE 18

AIRCRAFT MAINTENANCE ENGINEER TRAINING

INDIRECT OPERATIONAL COSTS

R - INDIRECT OPERATIONAL COSTS 3rd YEAR COURSE

* Amounts are Estimated
**Program Length Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY,	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE,	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT,
COST	NO COST	£34,577.00 x .25 =£8,644.00	NO COST	NO COST
COST IN CANADIAN CURRENCY £1 British = $2.31 Canadian	NO COST	£8,644.00 x 2.31 =$19,968.00	NO COST	NO COST

TABLE 19

AIRCRAFT MAINTENANCE ENGINEER TRAINING

DIRECT INSTRUCTIONAL COSTS

A - DIRECT INSTRUCTIONAL COSTS 4th YEAR COURSE

* Amounts are Estimated
**Program Length Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
COST	NO COST	£11,110.00 x .08 =£889.00	NO COST	NO COST
COST IN CANADIAN CURRENCY £1 British = $2,31 Canadian	NO COST	£889.00 x 2.31 =$2,053.00	NO COST	NO COST

TABLE 20
AIRCRAFT MAINTENANCE ENGINEER TRAINING
INDIRECT OPERATIONAL COSTS

R - INDIRECT OPERATIONAL COSTS

4th YEAR COURSE

*Amounts are Estimated
**Program Length Cost Adjustments are applied

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY,	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE,	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT,
COST	NO COST	£34,577.00 x .08 =£2,766.00	NO COST	NO COST
COST IN CANADIAN CURRENCY £1 British = $2.31 Canadian	NO COST	£2,766.00 x 2.31 = $6,390.00	NO COST	NO COST

TABLE 21

AIRCRAFT MAINTENANCE ENGINEER TRAINING

INTAKE OF TRAINEES

I - INTAKE OF TRAINEES

*FIGURES ARE APPROXIMATE

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COUNTRY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
AVERAGE NUMBER OF TRAINEES	60	14	175	18

TABLE 22

AIRCRAFT MAINTENANCE ENGINEER TRAINING

CONTRIBUTIONS TO TRAINING

AIR TRANSPORT AND TRAVEL INDUSTRY TRAINING BOARD

TRAINING COST CONTRIBUTIONS PER ANNUM

Figures are cost adjusted to program length

INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
1st Year A.T.T.I.T.B. Cost Contribution	NIL	£6,702.00 x .31 = £2,083.20	NIL	£5,400.00 x 1.0 = £5,400.00
2nd Year A.T.T.I.T.B. Cost Contribution	NIL	£6,720.00 x .25 = £1,680.00	NIL	NIL
3rd Year A.T.T.I.T.B. Cost Contribution	NIL	£6,720.00 x .25 = £1,680.00	NIL	NIL
4th Year A.T.T.I.T.B. Cost Contribution	NIL	£6,720.00 x .08 = £ 537.60	NIL	NIL
TOTAL	NIL	£ 6,720.00	NIL	£5,400.00
COST IN CANADIAN CURRENCY £1 British = $2.31 Canadian	NIL	£6,720.00 x 2.31 = $15,523.00	NIL	£5,400.00 x 2.31 = $12,474.00

TABLE 23
AIRCRAFT MAINTENANCE ENGINEER TRAINING
COSTS OF TRAINING

TOTAL OF DIRECT AND INDIRECT EXPENDITURES ON TRAINING

A "INSTRUCTIONAL" + R "OPERATIONAL"

Canadian Currency

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS, GATWICK AIRPORT, HORLEY, SURREY
1st Year A + R Costs	$326,122.00	$32,716.00	$1,945,921.00	$301,478.00
2nd Year A + R Costs	$176,105.00	$26,384.00	$972,960.00	NIL
3rd Year A + R Costs	NIL	$26,384.00	NIL	NIL
4th Year A + R Costs	NIL	$8,443.00	NIL	NIL
TOTAL A + R Costs	$502,227.00	$93,927.00	$2,918,881.00	$301,478.00

TABLE 24
AIRCRAFT MAINTENANCE ENGINEER TRAINING
COSTS OF TRAINING

COSTS OF TRAINING $C = \frac{A + R}{I}$

Canadian Currency

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
TOTAL (A) + (R) COSTS Direct and Indirect	$502,227.00	$93,927.00	$2,918,881.00	$301,478.00
AVERAGE NUMBER OF TRAINEES I	60	14	175	18
COST	$8,370.00	$6,709.00	$16,679.32	$16,748.77

TABLE 25

AIRCRAFT MAINTENANCE ENGINEER TRAINING

COSTS OF TRAINING

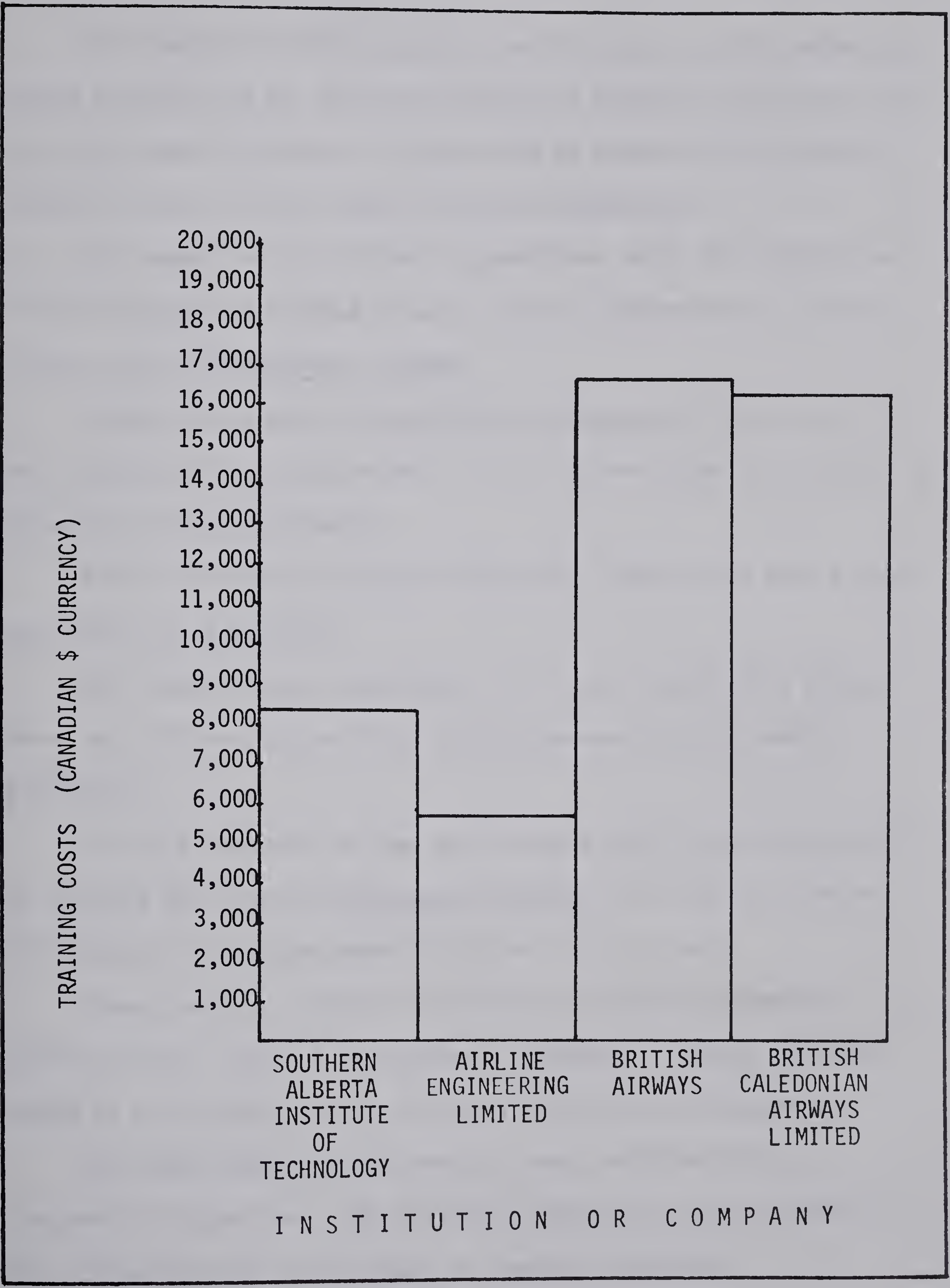
COSTS OF TRAINING TO THE INSTITUTION OR INDUSTRY
AIR TRANSPORT AND TRAVEL INDUSTRY TRAINING BOARD
TOTAL COST CONTRIBUTIONS

Canadian Currency

COUNTRY	CANADA	UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM
INSTITUTION OR COMPANY	SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY, CALGARY, ALBERTA	AIRLINE ENGINEERING LIMITED, LUTON AIRPORT, BEDFORDSHIRE	BRITISH AIRWAYS, SPEEDBIRD HOUSE, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX	BRITISH CALEDONIAN AIRWAYS LIMITED, GATWICK AIRPORT, HORLEY, SURREY
Cost of Training One Trainee	$8,370.45	$6,709.00	$16,679.32	$16,748.77
Less A.T.T.I.T.B. Contribution per Trainee	NIL	$15,523.20 ÷ 14 = $1,108.60	NIL	$12,474.00 ÷ 18 = $693.00
COST OF TRAINING LESS CONTRIBUTIONS	$8,370.45	$5,600.00	$16,679.32	$16,055.77

TABLE 26

TOTAL TRAINING COST COMPARISON
BETWEEN
AIRCRAFT MAINTENANCE ENGINEER TRAINING CENTERS



CHAPTER V

CONCLUSIONS OF THE STUDY

With the cost figures obtained from the study a cost comparison became possible and the four institutions or companies involved in Air-Craft Maintenance Engineer training could be ranked from the lowest financial outlay to the largest financial expenditure.

The company having the least expenditure total for training was Airline Engineering Limited of Luton Airport, Bedfordshire, United Kingdom, with $5,600.00 per trainee.

Second with a cost of $8,370.00 per trainee was the Aircraft Maintenance Engineering Department at the Southern Alberta Institute of Technology, Calgary, Alberta.

British Caledonian Airways Limited was ranked third with a cost per trainee of $16,055.00.

The fourth company researched in the study was British Airways whose cost of training one Aircraft Maintenance Engineer came to $16,679.00.

The data presented in the study relates only to the money spent on training one Aircraft Maintenance Engineer up to the point where the trainee could become productively active (licensed).

Reasons why the costs of training an Aircraft Maintenance Engineer differ from one institution or company to another are presented by a detailed analysis of each of the costing categories.

The first comparison and analysis deals with the ratio of trainees to instructors. The following breakdown gives an indication of how the four institutions or companies compared:

NOTE: Abbreviations for all four institutions/companies have been used throughout this chapter:

A.E.L. = Airline Engineering Limited
S.A.I.T. = Southern Alberta Institute of Technology
B.C. = British Caledonian
B.A. = British Airways

Institution of Company	A.E.L.	S.A.I.T.	B.C.	B.A.
Average No. of Trainees	14	60	18	175
Average No. of Instructors	2.5	8.5	4.0	24.0
Trainee-Instructor Ratio	5.6:1	9.4:1	4.5:1	7.3:1

(The above information is based on 1978 figures.)

The indication was that the higher the trainee-instructor ratio, the lower the cost of training per trainee. However, such is not always the case, for instructors in industry are usually not full-time training personnel and have other duties to perform (inspection, quality control, administration). These other duties can bring to the employing company some financial return which can offset a portion of the money being paid out in instructional fees.

In a public technical institution, the instructor's role, as a rule, is totally devoted to instruction, and no financial return can be expected by the institution. This situation gives the training by industry some financial advantage.

The costs of textbooks were not really significant, but material and supply costs were. The following chart presents the cost per

trainee for materials and supplies:

Institution or Company	A.E.L.	S.A.I.T.	B.C.	B.A.
Average No. of Trainees	14	60	18	175
Cost of Materials & Supplies/year	£192 x 2.31 =$443.52	$4536.00	£144 x 2.31 =$332.64	£1750x2.31 =$4042.50
Average Cost of Materials & Supplies/Trainee	$31.68	$75.60	$18.48	$23.10

(Funds expressed in Canadian currency. Information is based on 1978 figures.)

Since the cost for equipment and tools for each trainee was nearly the same in both the United Kingdom and in Alberta, no real cost-comparison had to be made. The reasons for this similarity are:

1) The engines, airframes, and avionics receiving maintenance and repair were usually of the same manufacture. Engines are usually Pratt and Whitney, General Electric or Rolls Royce; airframes are usually Boeing, Douglas, Lockheed, or De-Havilland. Therefore, the diagnostic equipment and tools used were similar.
2) The quantity of equipment and tools required by each trainee was approximately the same.
3) The cost of the equipment and tools required by each of the trainees was approximately the same.

The private aircraft companies do have a financial advantage in this area because of the British and Canadian tax laws which allow tax

deductions and write-offs for equipment and tools. Public institutions do not have this advantage.

The salaries paid to the Aircraft Maintenance Engineer trainees were very significant in the determination of training costs because a wage is not usually paid to any trainees from public training funds. In Alberta, the trainee has, at least in part, the responsibility of looking after some of his/her expenses. Some trainees may receive training while under the assistance of departments of employment, manpower, or social services. Most trainees at the Southern Alberta Institute of Technology receive no wages while training, whereas those trainees at Airline Engineering Limited, British Caledonian Airways Limited, and British Airways do receive a wage. The following chart presents the wages of one trainee (apprentice) in each institution or company during the training period.

Institution of Company	A.E.L.	S.A.I.T.	B.C.	B.A
Average No. of Trainees	14	60	18	175
Total Salaries of Trainees	£24,053x2.31 =$55,562.43	NIL	£36,288x2.31 =$83,825.28	£352,800x2.31 =$814,968.00
Average Salary of Trainee	$3,968.74	NIL	$4,656.96	$4,656.96

(Funds expressed in Canadian currency. Information is based on 1978 figures.)

It should be noted that Airline Engineering pay their trainees less than British Caledonian or British Airways.

The salaries of administration and support personnel are especially noteworthy, as these large costs have a great effect on the total costs of training.

The following chart gives the administration and support staff costs per trainee in each institution or company:

Institution or Company	A.E.L.	S.A.I.T.	B.C.	B.A.
Average No. of Trainees	14	60	18	175
Salaries of Admin.& Support Personnel	£9,400x2.31 =$21,714.00	$65,900.00	£10,500x2.31 =$24,255.00	£138,500x2.31 =$319,935.00
Average Cost of Admin.& Support Personnel/ Trainee	$1,551.00	$1,098.33	$1,347.50	$1,828.20

The Aircraft Maintenance Engineer training program needs organization and leadership. To obtain this direction and have it properly administered, administrators and support personnel who bring to the position a logical, inexpensive, and highly productive flow of command must be engaged. However, if the role of the administration is a reward for past services or merely a horizontal move for money or prestige, then the leadership position is not fulfilling the real requirements.

A self-perpetuating, self-justifying administrative organization is not in the best interests of quality, cost-conscious, technical training. The administration should not be regarded as an employment office for senior members who had difficulty coping with the training role.

One of the observations made by this writer is that those companies visited, with the exception of Airline Engineering Limited, were overstaffed with administrative personnel. This excess of administrative and support staff can stifle the lines of decision-making and make departmental contact and control difficult.

The answer to the problem would seem to lie in having a small administrative staff (Airline Engineering Limited) who have a technical command and understanding of the program being taught and who are at ease among instructors and trainees.

The cost of plant and training facility operation is a large contributor to the total costs of training. A shop area which is used for Aircraft Maintenance Engineer training must be large enough to accommodate the various aircraft assemblies (wings, fuselage, powerplants). Along with portions of the aircraft is the related equipment (tools, jigs, testing instruments) all of which requires a great deal of space.

All of this space requires some form of lighting, heating, ventilation, and related services. Utilities cost money, and the larger the facility, the greater the costs. The following chart gives the operation and maintenance costs of each facility.

Institution or Company	A.E.L.	S.A.I.T.	B.C.	B.A.
Average No. of Trainees	14	60	18	175
Cost of Oper. & Maint.	£69 x 2.31 =$159.39	$44,231.00	£18,000x2.31 =$41,580.00	£158,320x2.31 =$365,719.20
Average Cost of Oper. & Maint./ Trainee	$11.36	$737.18	$2,310.00	$2,089.82

Equipment repair, maintenance, and other costs are difficult to compare because of the many variables with the equipment - age, size, manufacturer, and complexity of design. The following chart presents the cost of equipment repair and maintenance per trainee.

Institution or Company	A.E.L.	S.A.I.T.	B.C.	B.A.
Average No. of Trainees	14	60	18	175
Cost of Equipment Repair & Maint.	£45 x 2.31 =$103.95	$827.00	£220 x 2.31 = $508.20	£24,000x2.31 =$55,440.00
Average Cost of Equip. Repair & Maint./Trainee	$7.42	$13.78	$28.23	$316.80

What is significant about the costs of equipment repair and maintenance is that at Airline Engineering Limited a very small facility is used for theoretical training (1760 square feet), and practical training is done in the six-member company shops. These six companies absorb the real costs of operation and repair into their regular operational and maintenance bills.

Such a system does keep the operational and repair costs low in comparison with the other companies in the study.

British Airways displayed a very large number of maintenance and custodial staff, making their equipment repair and maintenance bill the highest of the four establishments studied.

The area which deserves some level of scrutiny because of its distinct lack of costs and impact on the study was research and development

for instruction. Very little money and, in some cases none, seemed to have been allocated for researching new methods of instruction, new materials, or new textbooks. The research and development of training seemed to lie exclusively in the hands of the Industry Training Board.

This concludes the analysis of the expenditures on training by Airline Engineering Limited, Southern Alberta Institute of Technology, British Caledonian Airways Limited and British Airways.

I. DEDUCTIONS OF THE STUDY

The deductions which may be derived from the research and the data presented in this study are:

1) Airline Engineering Limited, as a private aircraft maintenance training enterprise, showed itself to be less costly than the other establishments surveyed in this study, because of the company's excellent utilization of their training space and facilities.
2) Airline Engineering Limited was able to train an Aircraft Maintenance Engineer trainee for less than the other training centers because of their short, off-job theoretical training period.
3) Full usage of instructional and administrative personnel shown by Airline Engineering Limited kept training costs to a minimum.
4) Airline Engineering Limited emphasized the fact that training and cost advantages can be accrued from having groups of private companies with similar training requirements come

together and unite for a common purpose (Aircraft Maintenance Engineer training).

5) Some of the credit for Airline Engineering Limited being able to train employees for less money than the other institutions can be attributed to a cost-conscious administration. Good management cannot be over-emphasized when costs of training are determined: if budget "fat" is allowed to accumulate, then the whole training endeavor becomes a costly burden.

6) There are advantages in keeping training costs at a minimum, in in-depth continuous pre-planning of technical programs and facilities.

7) Some companies and industries should consider undertaking training with the idea of fulfilling a demand and, at the same time, gaining some financial assistance and profit from the public sector.

8) Training facilities to gain maximum cost-benefit must be used extensively, both during the day and in the evening.

9) Training facilities and instructional personnel may be leased out to other organizations in order to gain revenue. Many companies employ this technique of leasing training programs and staff in order to train their own technicians. (British Airways is extensively involved in the training of many Asian and African airline and charter companies.)

10) The success of a publicly-funded technical training program such as that of Aircraft Maintenance Engineering would seem to lie in the professional educator approach to training. In the opinion of this writer, there can be no substitute for

administrators and instructional staff who comprehend what is required in a program and who knows how to obtain the correct results.

As an alternative to public system funding for technical training, the concept of industry undertaking their own training has merit.

II. STRENGTHS OF THE INDUSTRY TRAINING BOARDS

The Industry Training Board concept is now firmly established in the United Kingdom. It would seem a logical progression for such a training concept to perhaps become established world-wide as an example of technical training by industry. In particular, the Third World countries might adopt this method of funding training, for if these countries are to achieve the level of technological expertise needed for industrial growth, then there must be a concentrated financial effort by all the industrialized nations to secure the type of training needed.

These Third World nations do not have the necessary physical or financial resources for technical training; thus, it would fall upon those countries which have the resources to train those needed personnel. This condition would require a funding levy imposed upon all of the related industries throughout the world.

The resources pooled by this action would pave the way for the more backward nations to emerge industrially and would allow a better standard of living for their citizens.

Within the industrialized nations the possible merits of the system would be evident, for the concept of industry paying a large

portion of the technical training bill appears to be pleasing when received by the tax-paying public.

What also may be appealing is that the physical facilities of industry could be utilized for training. The duplication of these industrial areas by the public educational system is brought about only at great expense and effort.

The industries themselves do not suffer financially, for they train the type of individual desired with the type of training wanted and can oversee the whole training operation in their own establishments.

Lastly, the companies within the industries can deduct all or at least a portion of the funds expended as an income tax deduction.

The trainees involved would also welcome training in the industrial environment, for they are then involved directly with the industrial setting and all of the related processes. This direct involvement and first-hand experience gives the trainee much more grasp of exactly what is involved.

III. WEAKNESSES OF THE INDUSTRY TRAINING BOARDS

One of the weaknesses of the Industry Training Board concept is that while it is good in principle, it could become a "bureaucratic octopus". This term has been used to describe the large bureaucracy needed to manage and administer a training board.

Others have said that the concept is a "self-perpetuating empire" which is now simply training for the mere sake of training.

The involvement of the trade unions and their influence upon the

job designations and training has also influenced the Board's authority. The various labor movements have sought to better the lot of those in their own trade areas while excluding others who have not belonged. This bias and attempt to elevate some workers' skills over others has been, in some cases, detrimental to the Industry Training Boards.

It is in the nature of the free enterprise system to secure their operational requirements for the least expenditure of time and money. This is only good business practice, but some companies have not had the same enthusiasm for training as others and have sought to obtain trained employees by other less ethical routes (e.g. poaching).

Other companies within an industry have endeavored to obtain the maximum levy exemption and pay as little as possible. The result has been shortages of money in some cases and, therefore, a deterioration in the training effectiveness.

IV. RECOMMENDATIONS OF THE STUDY

The results of the costs of training obtained in a cost-comparison study of this kind provide an appraisal of some of the funding alternatives available for technical training.

With the comparison of the systems of funding, one cannot say whether one training system is markedly better than another. The equalizing feature is if the alternative systems are "effective" and "beneficial".

Both of these terms - effectiveness and beneficiality - are difficult to quantify and qualify in terms of costs and training. The difficulty lies in the number of conflicting variables present when

one is seeking to determine if a training program is producing capable trainees or if that trainee has been helped by the training.

Whatever the problems found in cost studies of this kind, research into the costs of technical training should continue.

Some of the suggestions that may be made for further study and research are:

1. That an easily understandable, accurate, and total cost assessment accounting system be devised for recording and analyzing technical training in general and Aircraft Maintenance Engineer training in particular.
2. That further studies be undertaken to explore the variety of plans whereby government, industry and educational institutions work in cooperation with one another in the establishment of technical training programs.
3. That attempts should be made to identify the characteristics of training systems which have developed "cost-efficient" and "cost-beneficial" programs in order that the Alberta technical training system can implement such characteristics in their own programs.

V. SUMMARY

Expenditures on post-secondary training have been on the increase in Alberta and, in all liklihood, will continue to increase in the future. Along with the increasing costs of training there exists a possibility of a shortage of trained Aircraft Maintenance Engineers in Alberta.

Therefore it would appear a judicious move by those responsible for Aircraft Maintenance Engineer training to inquire into various sources of new funding and systems of training in order to provide for a greater training effort which may be required to assure an adequate supply of trained Aircraft Maintenance Engineers.

What this study has endeavored to do is to present the British system of training aircraft maintenance personnel (accomplished by the Air Transport and Travel Industry) as a possible alternative to the present system now employed in the province of Alberta.

The reasoning behind the study was to portray a training situation where industry and technical training work together in order to avoid the expensive duplication of facilities and resources which is inherent in the present system of training highly skilled engineers and technicians.

An important challenge for the technical training system, perceived by this writer, is to utilize the available training resources of both the public and private sectors in the most cost beneficial manner.

With the results obtained from the study, it would appear that training by industry does have merit by avoiding unnecessary duplication of facilities and resources. The most notable feature is that, by having industry and a technical training system operate together in a training function, both can benefit and grow.

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APPENDIX A

THE SHORTAGE OF ENGINEERS IN THE AIR TRANSPORT AND GENERAL AVIATION INDUSTRIES

Summary of

A Report of the Engineer Training Conference

Held at

The Center Airport Hotel, November 25, 1977

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Designed and published by the Air Transport and Travel
Industry Training Board, Staines House, 158/162 High
Street, Staines, Middlesex.

FOREWORD

This report outlines the presentations and discussions relating to the provision of aeronautical and avionic engineers for the Air Transport and General Aviation Industries which took place at a Conference held on 25 November 1977 at the Centre Airport Hotel, Heathrow. The delegates included leading personalities in the Air Transport and General Aviation Industries.

The Board intends to develop its plan to deal with the shortage of engineers in line with the sentiments expressed in the report, and would always be glad to receive further views in this respect. These should be addressed to Mr. D. Woods, Senior Project Development Adviser, at the Air Transport and Travel Industry Training Board, Staines House, 158/162 High Street, Staines, Middlesex, TW18 4AS.

SUMMARY OF CONCLUSIONS

THE POSITION AND SHORTAGE

(1) An annual requirement of some 840 aeronautical engineers is required by this Industry over the next 3 years.

(2) This number will probably increase to 1100 over the following 5 years and beyond.

(3) At present about 340 engineers are trained annually, and about 200 are probably engaged directly by companies, leaving an annual shortfall of about 300 engineers.

MEANS OF PROVISION - PRESENT AND FUTURE

(1) The immediate means of providing for the shortfall is to increase the number of trainees through the Board's Adult Engineer Training Scheme, so that the 100 input from TOPS is complemented by an input which is financially sponsored by employers.

(2) The Board is discussing with the Ministry of Defence how best to encourage ex-Service people to join the Industry, and has made arrangements so that companies have an early opportunity to offer training and employment to those who are available.

(3) In the longer term greater provision must be made for the ab-initio training of aeronautical engineers not only through established apprentice schemes, but also on shorter training courses for specialist needs as described in the Manpower Services Commission (MSC) Consultative Document Training for Skills - obtainable from the MSC at Selkirk House, 166 High Holborn, London WCIV 6PF.

BROAD ACTIONS FOR THE FUTURE

The Board will:

(1) Continue to publicise to the Industry the Adult Engineer Training Scheme.

(2) Encourage employers to financially sponsor trainees into the courses.

(3) Examine alternative methods for meeting costs in the longer term in line with MSC policies and with particular regard to the problems facing small companies.

(4) Examine the requirement for, and training of, aircraft fitters other than through Technician and Craft courses of the established pattern.

(5) Make arrangements for a further conference in the Autumn of 1978 to up-date the position and evaluate the effectivensss of the action taken.

CONFERENCE REPORT

Introduction

An Engineer Training Conference was held on 25 November 1977 at the Centre Airport Hotel when 80 people attended. Delegates represented air transport and general aviation companies, trade associations, colleges, training establishments, Government Departments, and included Board and Committee Members of the ATT/ITB. The Conference Chairman was Mr. J. H. Arkell who is Chairman of the Air Transport and Travel Industry Training Board.

The aim of the Conference was to survey the engineer manpower scene and discuss the provision of, and training for, engineers in the air transport and general aviation industries. In particular support was to be requested for the ATT/ITB Adult Engineer Training Scheme (AETS) by the active participation of employers in financially sponsoring trainees.

There were two staff presentations to the Conference. The first gave a background to adult training and outlined the part that the Adult Engineer Training Scheme has played in the past two years in providing licensed engineers into the Industry. The second was about engineer manpower and the implications to the Industry of the shortfall of engineers both now and in the years ahead, and the revisions which the Board has made to the Adult Scheme to provide a wider range of engineer training options to the Industry.

Following the staff presentations discussion was invited from the floor. Delegates were asked for their views and in particular to answer a series of questions that had been previously circulated.

An outline of the presentations and the discussion which followed is given in the following paragraphs. The report concluded with a summary of future actions by the Board.

Board Presentations

The Director of the Board, Mr. G. R. D. Calder, outlined the history of the AETS and the part played by the four training schools at Bristol, Luton, Oxford and Perth. The financial contribution made by

the Training Services Agency (TSA) through the Training Opportunities Scheme (TOPS) was stated. This financial arrangement is conditional on the Industry becoming involved with the training and soon sharing the burden of the cost.

The Director then discussed the benefits the Industry had received from the Scheme so far and the excellent results achieved from the training courses. It was stated that over 95% of those who had completed training had joined the Industry: this represented a total of around 142 engineers from January 1976 to August 1977.

Mr. Calder went on to outline the threat to the Scheme which had arisen because the input of trainees had so far been financed solely by the TSA, and that unless Industry made a contribution by using the training facilities for its own employees or financially sponsored trainees, the TSA might withdraw its support in the near future. The Scheme would then flounder; the Industry would lose the injection of some £200,000 per year into aeronautical and avionic training; and we would lose the input of 100 engineers into the Industry each year.

The Director concluded by briefly mentioning the revisions to the Scheme that had now been made. These could be effective in 1978. The revisions provided shorter courses of modular construction on a wider range of topics giving improved training options.

The final point made by the Director was that in order to stave off foreclosure from TSA the Board needed to demonstrate, preferably by September 1978, that Industry financial involvement with the Scheme had been, or was about to be, achieved in the near future.

Mr. Woods then gave details about engineer manpower and the training of engineers. Manpower facts for the Industry were quoted covering numbers, growth, wastage, future forecasts, age profiles and so on. The numerical data presented to the Conference is given at pages 99 to 108 of this report. This shows that there is an annual shortfall of 300 or so aeronautical and avionic engineers and this will continue in the years ahead. Indeed, this shortfall will get worse in the early 1980s because of the large bulge in the age profile that markedly increases the number of age retirements.

Mr. Woods went on to show how the Industry has obtained its engineer manpower in past years of which about 30% (see Fig. 7) was from ab initio training and the remainder from the labour market including ex-Service trained engineers. He suggested that the deficit in aircraft engineers will not now be so readily made up from the labour market because of greater competition from other engineering industries; because of labour market demands from overseas where a large number of British aeronautical and avionic engineers are employed; and finally because of the greater demands of the Industry to fulfill its own growth requirements. All these demands will be accentuated by the progressively reducing number of ex-Service aeronautical engineers who are likely to leave the Forces in the next decade.

Mr. Woods outlined the engineer training which is promoted by the Board and mentioned the self-study package available through the General Aviation Sector, and the initiatives to stimulate more Technician and Craft Training.

The revisions to the Adult Engineer Training Scheme were then given in detail. It was emphasised that the Adult Scheme serves two purposes:

(1) It brings new entrants with aeronautical backgrounds into the Industry and orientates them to the civil aviation requirement.

(2) It provides refresher, upgrading, licence and specialist training for companies.

The courses which are run by Air Service Training Perth, Brunel College Bristol, Oxford Air Training School and the Aeronautical Group Luton were then explained in detail. These particulars are also given in a booklet produced by the Board which all delegates have received.

Mr. Woods concluded his presentation by saying that arrangements were now being made to invite employers to take part in the interview of prospective trainees for these courses who largely come from the Services. These new arrangements would enable companies to make an early approach to likely employees so that offers of future employment could be made and training specified (preferably at Company cost) to the particular requirements of both Company and individual.

Finally, it was reiterated that while some 840 engineers (see Figs. 5 & 8) are needed by the Industry each year over the next 3 years (and probably even more per year in the early 1980s, Fig. 6) only 240 or so are trained through ab initio training schemes, with 100 passing through the Adult Scheme, the remaining 500 or so each year must come from the labour market (see Fig. 8). A deficit as large as this will undoubtedly have a significant destabilizing employment effect and will encourage movement between firms. Since the deficiency is likely to be too large to be remedied by movement into the Industry, it follows that Employers would only be able to meet these demands by sponsoring more training. This could increase the training commitment within the industry by a further 300 over and above the 340 presently being trained. Thus, unless a more systematic approach to recruitment and training is instituted the difficulties already being experienced would be exacerbated in the years ahead.

Conference Discussion

The following points emerged:

(1) The effect of contract labour would be studied, but generally speaking it was considered this would not significantly alter the theme of the argument.

(2) Manpower predictions of wastage although based on 1976 company data, are as realistic as can be obtained from any source, and are considered to be reasonably representative of the future since the growth figures are those from company forecasts for the next 3 years. The fact that 1976 was used to collect the data should not therefore undermine the validity of the trends. This is already being borne out by manpower information presently being collected.

(3) Because of the importance to the Industry of ex-Service trained manpower the Ministry of Defence had agreed to provide details of the numbers and trades of Servicemen due for release each year. At the instigation of the ATT/ITB a Working Group had not been set up between the Board and the MoD to discuss resettlement issues and to encourage Servicemen to enter the civil aviation field.

(4) A view was expressed that the Services should encourage training to civil aviation requirements particularly towards the end of a career in the Services. It was pointed out to the Conference that Service training (the RAF in particular) is geared to the minimum Service requirement and costs would preclude the Services extending training courses to any degree unless there was a Service need. However, the RAF are examining this problem and Servicemen are being encouraged to prepare for the civil aviation field during their final 2 years of service.

(5) In general the Conference agreed that the data and forecasts of engineering manpower were representative of the situation in individual companies. There was general acceptance of the predictions made i.e. that some 8.4% (see Fig. 5) of engineering manpower was required annually; that there is a shortfall of 300 or so each year in meeting this figure; and that other factors being equal the future situation will worsen due to the bulge on the age profile.

(6) The Industry requires both licensed and unlicensed engineers, also it requires fitters and lower skilled people than Technicians. The Adult Scheme has concentrated previously on licensed engineers. The new Scheme does provide a much wider range of training options including both licensed and unlicensed requirements. There is also now a facility for training, as fitters, young people entering the Industry for the first time and without recourse to lengthy apprentice courses. It was however mentioned from the platform that fitter

training is under discussion with employers and Trade Unions. The issue is delicate and will need much discussion before deciding upon the best and most acceptable course of action.

(7) In response to a suggestion that the Adult Scheme, although excellent, should be extended to embrace a wider range of training for differing groups of people related to the jobs to be carried out in the Industry, it was confirmed there was no reason, for instance, why ab initio fitter training should not be part of the Scheme as well as the conversion of tradesmen from other industries - for instance motor car fitters to aeronautical fitters.

(8) One delegate expressed the view that avionic courses should include workshop training for in-depth repair of radio equipment. Present course lengths would not however allow for this treatment and it would be necessary to examine whether there is a general requirement. The Board agreed to look into this subject.

(9) The small company representatives made the point that it was difficult to release employees for long periods of training, so the modular courses are certainly more attractive. They also referred to the high costs of training which a small company just cannot afford.

(10) The small company faces a higher risk of losing its investment in engineer training since trained engineers naturally look to the bigger companies for better job prospects and eventually gravitate across the Industry for this purpose. This is one of the main reasons why the labour turnover in small companies is high. Small companies are therefore reluctant to invest in training without some safeguard. Generally speaking a bonded arrangement with employees has been known to be successful and usually resulted in the acceptance of an obligation to an employee, even though this might not be strictly enforceable by litigation. It was suggested that some form of subsidy for training would lower the risk factor and encourage training investment. The Board would be examining this possibility to see what might be done.

(11) Delegates had no doubts that the Adult Scheme was very much required and support for its continuation was strongly endorsed. There was general agreement that Industry must pay for training carried out under the Scheme alongside the contribution made by the Government.

(12) Any of the prescribed training modules can be tailored to suit a company requirement. All that needs to be done is for the Company to contact the appropriate School and to discuss the matter. Also, where a company feels that additional modules are necessary to suit a company's need, these can also be negotiated with the Schools. In short, it was up to the Company to state its requirements in numbers and type of training and the Schools would be willing to accommodate all reasonable requests.

(13) The Board is now arranging to invite companies to the interviews of candidates from the Services and elsewhere who have requested training under the Adult Scheme. Thus companies will have the opportunity of selecting future employees from these engineers and offering them employment and training at company cost.

(14) The delegates welcomed the opportunity afforded by the Conference of getting together will all sections of the Industry, with other organisations and with the Board. It was generally felt that such conferences should be held no less frequently than yearly and possibly within 9 months for a progress report on future development and how present problems were being resolved. The next Conference will, therefore, be held in the autumn of 1978.

Closing Remarks

In his closing remarks the Chairman thanked the delegates for their attendance and for their contributions. He thought the occasion was unique in bringing together such a wide cross section of the Industry and its associated organizations and agencies, and with such an eminent attendance. The Board had gleaned a great deal from the Conference and would give consideration to all the points raised. It was encouraging to hear delegates giving very clear support to the Board's views on engineer manpower, the continuation of the Adult Engineer Training Scheme, and meeting of costs by companies. He hoped that employers would indeed henceforth play an active financial role in supporting the Adult Engineer Training Scheme.

The Chairman thanked the four training establishments for all their help, co-operation and enthusiasm in bringing the new courses for the Adult Scheme into being. He mentioned that the Schools would be prepared to discuss with employers any particular training need that becomes apparent and would take account of such needs in the design of training.

Future Action by the Board

The Board is taking action in the following areas:

(1) Continuing to publicise the Adult Scheme and the encouragement of companies to use the Scheme for training their employees.

(2) Informing employers of the procedure for their involvement in the interview of prospective candidates for training. These candidates will largely be ex-Service personnel. (A letter has now been sent to companies).

(3) Examining alternative methods for meeting the costs of training in the longer term in line with MSC policies, having particular regard to the problems facing small companies who are compelled to compete for a decreasing number of highly sought after tradesmen, possessing the long term transferable skills required in aeronautical engineering.

(4) Examining in detail the requirements for, and the training of, aircraft fitters other than through Technician and Craft courses of the established pattern. Since the date of the Conference a new "Training for Skills" document has been published by the MSC, and this examination can be carried out within the guidelines of future action outlined in that document.

(5) Arranging for a further Conference in the Autumn of 1978 so that the position of engineers for the Industry can be up-dated and the effectiveness of the actions taken can be evaluated.

NUMERICAL DATA PRESENTED
TO THE
CONFERENCE
BY THE
AIR TRANSPORT & TRAVEL INDUSTRY TRAINING BOARD

LIST OF FIGURES

Fig. 1. Adult Engineer Training Output 1976 and 1977.

2. TSA Financial Input.

3. Growth Forecasts 1976 to 1979.

4. The Loss of Engineers 1975 and 1976.

5. Growth and Wastage Forecasts 1976 to 1979.

6. Engineer Age Profile 1976.

7. Engineer Engagements 1975 and 1976.

8. Summary.

Fig.1

ADULT ENGINEER TRAINING OUTPUT
1976 and 1977

Trainees Accepted	204
Completed Training	130
Part Completed Trg.	12
Under Training	53
Joined Industry	95%

These figures show the benefit that the Industry has derived from the Scheme over the past 2 years in terms of licensed manpower which joined the Air Transport or General Aviation Industries. The wastage from the training courses has been about 4%.

Fig. 2

TSA FINANCIAL INPUT

		Approximate Expenditure (£)
CAPITAL	1975/76	50,000
ANNUAL	1976	250,000
	1977	250,000
	1978	170,000

The TSA has made available a capital sum of about £50,000 in 1975/76 to help start the Scheme. The financial input from the Training Opportunities Scheme (TOPS) has been about £250,000 each year for 1976 and 1977 to largely support ex-Service trainees through the courses. With the reduced course lengths starting in 1978 the TOPS financial input will be about £170,000.

Fig.3

GROWTH FORECASTS

(Period 1976 to 1979)

AIRFRAME, ENGINE and AVIONIC MANPOWER

SECTOR	A/FRAME/ENGINE		AVIONIC	
	Number	Av. Annual Growth %	Number	Av. Annual Growth %
British Carriers	5,550	5·5	2,200	2·7
General Aviation	1,200	1·6	700	1·0
TOTAL	6,750	4·8	2,900	1·2

Average Growth **4·1%**

These forecasts have been derived from data provided to the Board from companies across the Industry. The numbers include airframe, engine, and avionic (including electrical and instrument) trades. The average annual growth forecasts are for a 3 year period up to 1979. Taking all trades together for both sectors, then the average growth for the Industry is 4.1% per year.

Very few helicopter companies contributed data to these forecasts. A separate survey was therefore taken using a random sample which indicated a growth of some 8% a year for helicopter companies involved in North Sea oil activities. This figure is not reflected in the above and is in some quarters considered pessimistic.

Fig. 4

THE LOSS OF ENGINEERS

(Period 1975 to 1976)

	BRITISH CARRIERS	GENERAL AVIATION
TERMINATIONS	6%	17%
WASTAGE	4·3%	

An analysis was made of the employees who terminated their employment in the two sectors of the Industry during 1976 in order to isolate those who were lost to the Industry (wastage), from those who transferred between companies within the Industry. This exercise produced a wastage figure of about 4.3% for the Industry as a whole.

The high termination rate of 17% for the General Aviation Sector is indicative of the movement of a large number of employees, usually from the small to the larger companies of the Industry, with consequently higher training costs for the smaller companies.

Fig.5

GROWTH & WASTAGE FORECASTS

(Period 1976 to 1979)

AIRFRAME, ENGINE and AVIONIC MANPOWER

Number of Engineers............10,000

Growth 4·1% (Fig.3)

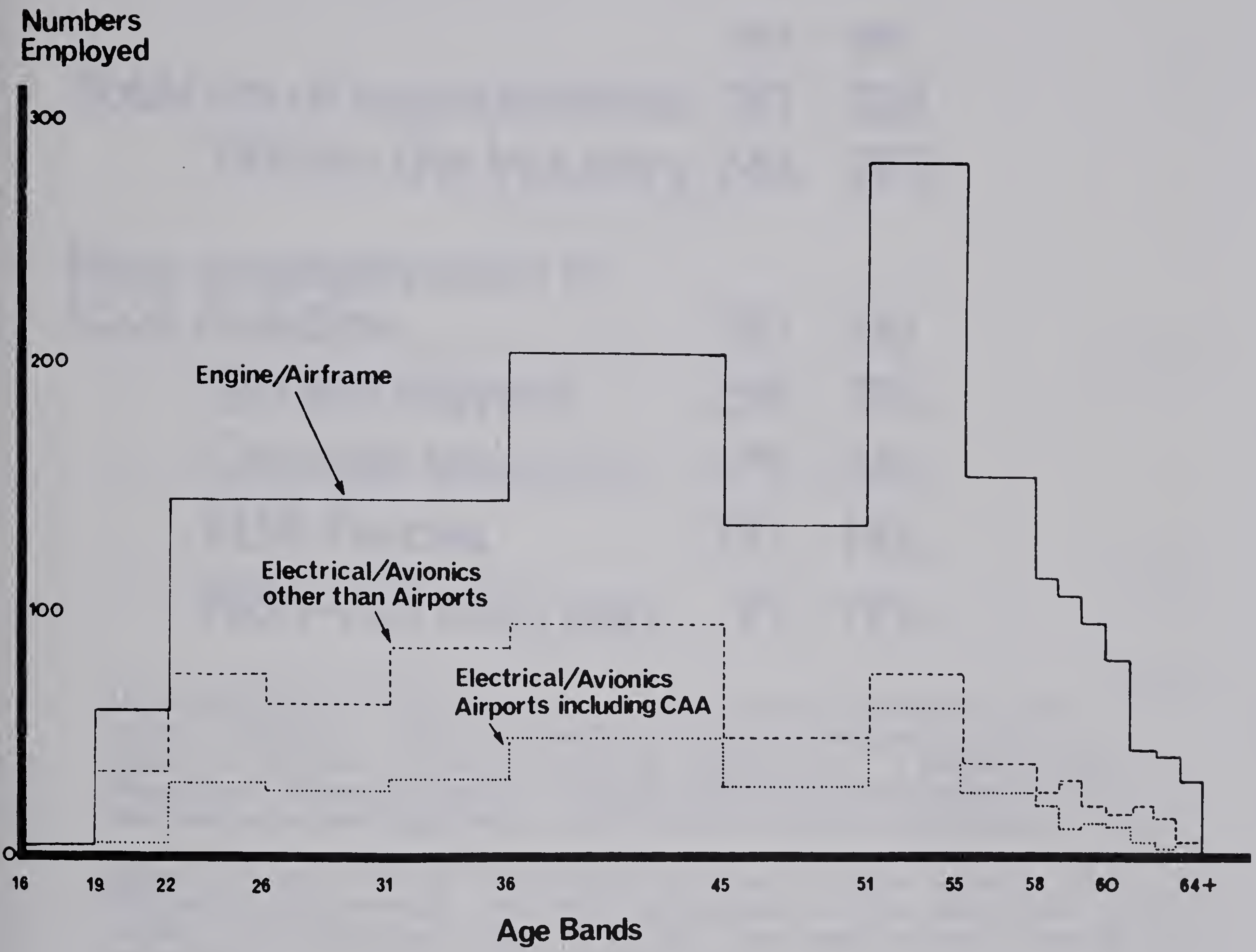
Wastage 4·3% (Fig.4)

Annual Requirement..................840

The number of aeronautical engineers employed by the Industry is about 10,000. The number of engineers that the Industry requires to find each year over the 3 year period to 1979 is about 840 using a combined growth and wastage rate of 8.4% annually.

Fig.6

1976
ENGINEER AGE PROFILE



NOTE: Total Employed = Sum of the Three Graphs.

The bulge in the age profile for the age band 51 to 55 shows that wastage due to age retirement will increase in the early 1980s. Therefore, all other facts being the same, the annual requirement of 840 engineers could increase to a level of 1100 annually and continue at this higher level for possibly 5 or more years.

Fig 7

ENGINEER ENGAGEMENTS 1975 & 1976

	1975	1976
Total no. of engagements	787	832
Within the Industry	24%	26%
New engagements to Civil Aviation	599	619
School leavers	29%	35%
Outside Industry	52%	34%
H.M. Forces	12%	14%
Non~working pop.	7%	17%

It is important to ascertain the source of trained aeronautical and avionic engineers. The total number of engineers engaged by the Industry in 1975 and 1976 was 787 and 832 respectively. A proportion of these moved between companies - 24% and 26% for these two years. The remainder were new engagements into the Civil Aviation environment.

Between 65% and 70% came from outside the Industry either directly from HM Forces, from overseas, from other occupations, or from unemployed persons. The remainder - about 30 to 35% - were young persons given ab initio training on first entering the Industry.

Those who came from outside the Industry and were trained aeronautical or avionic engineers had largely received their training from the Services. This course of trained engineers is diminishing and with increasing competition for the ex-Service people, the requirements of this Industry are unlikely to be met.

The forecast requirement for 1977 of new engagements to civil aviation is 840 (see Fig. 5), of which about 240 are apprentices representing some 30% of the total. The remainder, about 70%, had therefore to come from the labour market including the adult engineer scheme, HM Forces, and the non-working population. Data which has recently been

received from companies for 1977 indicates that the labour market has not been able to provide the engineers required, and this is borne out by the number of vacancies that exist in many companies at this time. This situation is likely to get worse due to an increase in age retirements (see Fig. 6) and therefore it is essential the Industry makes plans to provide more trained engineers by its own efforts particularly at fitter level.

Fig.8

SUMMARY

1	**Annual Requirement**	**840**
2	**Present Training Commitment**	
	(1) Apprentices	**240**
	(2) Adult Scheme	**100**
3.	**Other Sources (Company Recruitment)**	**200** **(About)**
4.	**Shortfall**	**300** **(About)**

About 840 engineers are required annually over the immediate years ahead and this figure will probably increase in the early 1980s. At the present time some 240 apprentices are trained each year and 100 licensed engineers (largely ex-Service) join the Industry from the Adult Engineer Training Scheme. Companies will also be recruiting from the labour market which is unlikely to be able to respond to the total demands of the Industry. A shortfall appears to exist of some 300 engineers each year, assuming there is no reduction in the present training commitment.

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